

# TAG QUARTERLY PROGRESS REPORT

Date: August 3, 2004

Report Number: 5

Report Period: April 1, 2004 to June 30, 2004

Site: Pantex Superfund Site

Grant Recipient: STAND, Inc.

Recipient Group Rep: Pam Allison, Project Manager

Technical Advisor: The Cadmus Group; IEER; George Rice

## PROGRESS ACHIEVED:

- The Cadmus Group - Conducted statistical evaluation of metals concentrations in playas soils.
- The Cadmus Group - Provided routine management activities, including writing and submitting progress reports.
- IEER - Continued working on comments and report regarding the Ditches & Playas RFI.
- IEER - Attended two (2) public meetings, representing STAND as technical advisors, on June 7, 2004.
- IEER - Presented information and results of technical review of the Radionuclide Investigation RFIR to representatives of both EPA and TCEQ, and the general public.
- IEER - Provided to EPA representatives its final written comments about the inadequacies of the Pantex Radionuclide Investigation RFIR. Provided the written and documented recommendation that the laboratory analyses be redone by a competent laboratory, and the data evaluation, conclusions, and RFIR be redone as well.
- George Rice - Reviewed and drafted comments on the *Final RCRA Facility Investigation Report: Groundwater, US Department of Energy Pantex Plant, Amarillo, Texas*.
- George Rice - Submitted draft comments to STAND for review and feedback or comments.

- George Rice - Clarified reviewers questions and comments regarding his draft comments on the Groundwater RFIR.
- George Rice - Submitted final comments to STAND for submission to the regulators (prior to regulators' final review of this document).
- Mavis Belisle - Reviewed parts of the *Independent Sites RFIR*, focusing on the Firing Sites and related solid waste management units.
- Mavis Belisle - Began writing comments based on her review of parts of the Independent Sites RFIR.
- Pam Allison - Reviewed parts of the *Independent Sites RFIR*, focusing on the Landfills, Playa 3, and related solid waste management units.
- Pam Allison - Began writing comments based on her review of the Independent Sites RFIR.
- Organized (with PANAL and Peace Farm) a citizens' meeting with representatives from EPA and local representatives from TCEQ, to discuss the Radionuclide Investigation RFIR. The June 7, 2004, meeting was held at 1 pm at the Square House Museum in Panhandle, Texas.
- STAND reviewed comments from IEER based on its review of the Radionuclides Investigation RFIR, from G. Rice based on his review of the Groundwater RFIR, and from M. Belisle and P. Allison based on their review of the Independent Sites RFIR.
- STAND compiled and submitted its technical advisors' comments from each of the RFIRs to representatives of EPA and TCEQ.

#### DIFFICULTIES ENCOUNTERED:

- Short Turn-around Times for TAs and STAND (because of the expedited schedules for review by the technical staffs of EPA and TCEQ, and their commitment to review all Pantex documents on an expedited schedule so not to "hold up" the cleanup decisions) - however, reviews and comments were completed and provided in time for consideration by both EPA and TCEQ.
- Additional and unexpected documents that required reviews - Pantex documents were submitted to EPA and TCEQ during this calendar year that had not been listed on the schedule provided to STAND (Independent Sites RFIR, not scheduled at all, comprised of 17 individual SWMU/AOC contaminated sites) or were ahead of schedule (Baseline Risk Assessment Work Plan, FY05).

**PERCENT OF PROJECT COMPLETED TO DATE:**

— 75 Percent

**DELIVERABLES PRODUCED THIS QUARTER:**

- IEER - Oral presentation of its basic information to the community during a public meeting on June 7.
- IEER - Discussion of its technical review of the Radionuclides RFIR with EPA representatives through discussions and written comments.
- IEER - Oral presentation (and explanation for non-scientists) to and with the community as to the importance of ratios in radionuclide analytical data, and why no conclusions could be drawn by Pantex based on its analytical data for radionuclides.
- IEER - Attendance at Pantex/TCEQ quarterly groundwater meeting, to gain information and to ask questions when relevant.

NOTE: STAND had requested that IEER be allowed to present their findings at the quarterly groundwater meeting. Pantex declined the offer, stating that they weren't ready for public input.

- George Rice - Written review of the Pantex Groundwater RFI, for submission to the EPA and TCEQ, prior to completion of the regulators' review of the same RFIR.
- STAND - P. Allison was invited to discuss environmental issues with and field questions from an interdisciplinary university class. The major concern of the college students, based on their questions, was water conservation and groundwater contamination at Pantex.
- STAND - Held a public event in which the progress of the work conducted under this TAG was discussed with interested persons in the community.
- STAND - Provided Technical Reviews of two Pantex RFIRs to the technical representatives of EPA and TCEQ, for their consideration.
- STAND - Held one public meeting to discuss Pantex-related issues and concerns with the public.

**ACTIVITY ANTICIPATED IN NEXT QUARTER:**

- Mavis Belisle - Written review of parts of the Pantex Independent Sites RFI, for submission to the EPA and TCEQ, prior to completion of the regulators' review of the same RFIR.
- Pam Allison - Written review of parts of the Pantex Independent Sites RFI, for submission to the EPA and TCEQ, prior to completion of the regulators' review of the same RFIR.
- STAND - Provide compiled and final Technical Reviews of Independent Sites RFIR to representatives of EPA and TCEQ, for their consideration.
- CADMUS - Deliver final draft of Citizens' Guide to the Zone 12 and Ditches & Playas RFIRs - for STAND to review, resolve comments, publish, and provide to the public.
- STAND - Provide summaries of the technical reviews and comments (previously provided to EPA and TCEQ) in newsletter articles for the community and broader public.
- STAND - Hold two public meetings that provide updates and information about the status of cleanup at Pantex.

# **TECHNICAL PROGRESS REPORT**

**Cadmus / STAND Contract No. 1**

**Technical Advisory Services for Serious Texans Against Nuclear Dumping**

**March 28, 2004 – April 24, 2004**

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 3, 2003

**Completion Date:**

November 2, 2004

## **Summary of Activities for the Current Month**

- Continued statistical analysis of metal concentrations in playa soils, comparing estimated background values with waste site values. Used several methods to compute alternative values of concentrations above background.
- Sent data analysis spreadsheet to STAND.
- Performed routine work assignment management activities, including writing and submitting progress report.

## **Problems Encountered and Remedial Actions Taken**

- None.

## **Anticipated Activities for Next Reporting Period**

- Continue work on Citizens' Guide.
- Undertake additional technical analysis and report writing activities, as requested by STAND.
- Perform routine work assignment management activities, including writing and submitting progress report.

## Project Milestones

Task	Completion Date
Review Zone 12 RFIR	December 23, 2003
Submit comments on Zone 12 Report to TCEQ	December 23, 2003
Submit Letter of Prelim. Findings on D & P RFIR	February 10, 2004
Submit Letter of Preliminary Findings on Baseline Risk Assessment Work Plan	February 10, 2004
Attend Public Meetings - March	March 1, 2004
Sent D & P data analysis spreadsheet to STAND	April 4, 2004
Submit Citizens Guide to STAND	

## Changes in Assigned Personnel

- None.

## Estimates for Next Month

LOE hours: (b) (4)

Dollars: [REDACTED]

## **TECHNICAL PROGRESS REPORT**

**Cadmus / STAND Contract No. 1**

**Technical Advisory Services for Serious Texans Against Nuclear Dumping**

**April 25, 2004 – May 29, 2004**

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 3, 2003

**Completion Date:**

November 2, 2004

### **Summary of Activities for the Current Month**

- Performed routine work assignment management activities, including writing and submitting progress report.

### **Problems Encountered and Remedial Actions Taken**

- None.

### **Anticipated Activities for Next Reporting Period**

- Continue work on Citizens' Guide.
- Perform routine work assignment management activities, including writing and submitting progress report.

### **Project Milestones**

<b>Task</b>	<b>Completion Date</b>
Review Zone 12 RFIR	December 23, 2003
Submit comments on Zone 12 Report to TCEQ	December 23, 2003
Submit Letter of Prelim. Findings on D & P RFIR	February 10, 2004
Submit Letter of Preliminary Findings on Baseline Risk Assessment Work Plan	February 10, 2004
Attend Public Meetings - March	March 1, 2004
Sent D & P data analysis spreadsheet to STAND	April 4, 2004
Submit Citizens Guide to STAND	

### **Changes in Assigned Personnel**

- None.

### **Estimates for Next Month**

**LOE hours:** (b) (4)

**Dollars:** (b) (4)



## **TECHNICAL PROGRESS REPORT**

**Cadmus / STAND Contract No. 1**

**Technical Advisory Services for Serious Texans Against Nuclear Dumping**

**May 30, 2004 – June 26, 2004**

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 3, 2003

**Completion Date:**

November 2, 2004

### **Summary of Activities for the Current Month**

- Performed routine work assignment management activities, including writing and submitting progress report.

### **Problems Encountered and Remedial Actions Taken**

- None.

### **Anticipated Activities for Next Reporting Period**

- Continue work on Citizens' Guide.
- Perform routine work assignment management activities, including writing and submitting progress report.

### **Project Milestones**

<b>Task</b>	<b>Completion Date</b>
Review Zone 12 RFIR	December 23, 2003
Submit comments on Zone 12 Report to TCEQ	December 23, 2003
Submit Letter of Prelim. Findings on D & P RFIR	February 10, 2004
Submit Letter of Preliminary Findings on Baseline Risk Assessment Work Plan	February 10, 2004
Attend Public Meetings - March	March 1, 2004
Sent D & P data analysis spreadsheet to STAND	April 4, 2004
Submit Citizens Guide to STAND	

**Changes in Assigned Personnel**

- None.

**Estimates for Next Month****LOE hours:****(b) (4)****Dollars:****(b) (4)**

# TECHNICAL PROGRESS REPORT

IEER / Stand Contract No. 1

Technical Advisory Services for Serious Texans Against Nuclear Dumping

April 1 – April 30, 2004

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 11, 2003

**Completion Date:**

November 10, 2004

## Summary of Activities for the Current Month

- Continued Review of Ditches & Playas RFI focusing on the Burning Grounds
- Received Pantex Radiation Document near the end of the month

## Problems Encountered and Remedial Actions Taken

- Requested additional documentation concerning EPA communication with the DOE and Pantex site contractor.
- Requested the following specific document  
Interoffice Memorandum from R.H. Gray, Environmental Protection, to C.L. Cizan, Environmental Safety, and Health, Mason & Hanger Corporation, Re: Building 12-64 Soil Sampling Results, September 15, 1994

## Anticipated Activities for Next Reporting Period

- Review of documents relating to activities involving radioactive materials at the Pantex site.
- Continue work on comments for the Ditches & Playas RFI
- Initial review of the Pantex Radiation Document

## Project Milestones

Task	Completion Date
Seek technical support by groundwater hydrologist George Rice, when helpful	(continues)
Review Ditches & Playas RFI	January 2004
Submit initial comments on Ditches & Playas RFI	January 2004
Submit report on comments regarding the Ditches & Playas RFI	June 7, 2004 (scheduled)

Task	Completion Date
Submit report on comments regarding the Pantex Radiation Document	June 7, 2004 (scheduled)

**Estimates for Next Month**

**Hours:**

(b) (4)

**Dollars:**

[REDACTED]

# **TECHNICAL PROGRESS REPORT**

**IEER / Stand Contract No. 1**

**Technical Advisory Services for Serious Texans Against Nuclear Dumping**

**May 1 – May 30, 2004**

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 11, 2003

**Completion Date:**

November 10, 2004

## **Summary of Activities for the Current Month**

- Began Review of Pantex Radiation Document.

## **Problems Encountered and Remedial Actions Taken**

- None

## **Anticipated Activities for Next Reporting Period**

- Complete review of Pantex Radiation Document.
- Continue work on comments for the Ditches & Playas RFI
- Present findings from the review of the Pantex Radiation Document to STAND, EPA, and to the public.

## **Project Milestones**

<b>Task</b>	<b>Completion Date</b>
Seek technical support by groundwater hydrologist George Rice, when helpful	(continues)
Review Ditches & Playas RFI	January 2004
Submit initial comments on Ditches & Playas RFI	January 2004
Submit report on comments regarding the Ditches & Playas RFI	June 7, 2004 (scheduled)
Submit report on comments regarding the Pantex Radiation Document	June 7, 2004 (scheduled)

**Estimates for Next Month**

**Hours:** (b) (4)

**Dollars:**

# TECHNICAL PROGRESS REPORT

IEER / Stand Contract No. 1

Technical Advisory Services for Serious Texans Against Nuclear Dumping

June 1 – June 30, 2004

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 11, 2003

**Completion Date:**

November 10, 2004

## Summary of Activities for the Current Month

- Completed initial review of Pantex Radiation Document, and more in-depth review of segments of the document.
- Presented findings to STAND, EPA, and the community.
- Provided written findings of the review to EPA on June 9.
- Received electronic radionuclide data from EPA, for review.

## Problems Encountered and Remedial Actions Taken

- None

## Anticipated Activities for Next Reporting Period

- Continue work on comments for the Ditches & Playas RFI.
- Review the electronic data obtained from EPA.

## Project Milestones

Task	Completion Date
Seek technical support by groundwater hydrologist George Rice, when helpful	(continues)
Review Ditches & Playas RFI	January 2004
Submit initial comments on Ditches & Playas RFI	January 2004
Submit report on comments regarding the Ditches & Playas RFI	in progress
Submit draft report on comments regarding the Pantex Radiation Document	June 7, 2004

Task	Completion Date
Submit revised report on comments regarding the Pantex Radiation Document	June 9, 2004

**Estimates for Next Month**

**Hours:**

(b) (4)

**Dollars:**

(b) (4)



## George Rice / Stand Contract No. 1

**April 1 – April 30, 2004**

Pamela S. Allison

November 11, 2003

November 10, 2004

- Receive copy of the Pantex Groundwater RFIR.

- None.

- Review Pantex Groundwater RFIR and draft comments based on the review.

Task	Completion Date
Provide technical support to CADMUS Group and IEER, as necessary	continues
Review _____	
Submit comments on _____ RFI	

**Hours:**

(b) (4)

**Dollars:**

100

## TECHNICAL PROGRESS REPORT

George Rice / Stand Contract No. 1

Technical Advisory Services for Serious Texans Against Nuclear Dumping

May 1 – May 31, 2004

STAND TAG Project Director:

Pamela S. Allison

Effective Date:

November 11, 2003

Completion Date:

November 10, 2004

### Summary of Activities for the Current Month

Review and provide comments on the *Final RCRA Facility Investigation Report, Groundwater, U.S. Department of Energy Pantex Plant, Amarillo, Texas, US Department of Energy, March 15, 2004* (groundwater RFI).

<u>Date</u>	<u>Hours</u>
-------------	--------------

5/12	(b) (4)
5/18	
5/19	
5/20	
5/21	
5/24	
5/31	

Total Hours =

Fee = (b) (4)

### Problems Encountered and Remedial Actions Taken

- None.

### Anticipated Activities for Next Reporting Period

- Continue working on groundwater RFI

## Project Milestones

Task	Completion Date
Provide technical support to CADMUS Group and IEER, as necessary	continues
Reviewed Pantex RCRA Facility Investigation Report GROUNDWATER (March 2004)	in progress

## Estimates for Next Month

Hours:

(b) (4)

Dollars:

(b) (4)

## TECHNICAL PROGRESS REPORT

George Rice / Stand Contract No. 1

Technical Advisory Services for Serious Texans Against Nuclear Dumping

June 1 – June 30, 2004

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

November 11, 2003

**Completion Date:**

November 10, 2004

### Summary of Activities for the Current Month

Review and provide comments on the *Final RCRA Facility Investigation Report, Groundwater, U.S. Department of Energy Pantex Plant, Amarillo, Texas, US Department of Energy, March 15, 2004* (groundwater RFI).

<u>Date</u>	<u>Hours</u>
-------------	--------------

6/1	(b) (4)
6/2	
6/3	
6/4	
6/5	
6/6	
6/7	
6/9	
6/10	
6/11	
6/12	
6/13	
6/14	
6/15	
6/16	
6/17	
6/22	
6/28	
6/29	

Total Hours =

Fee = (b) (4)

**Problems Encountered and Remedial Actions Taken**

- None.

**Anticipated Activities for Next Reporting Period**

- none

**Project Milestones**

Task	Completion Date
Provide technical support to CADMUS Group and IEER, as necessary	continues, as requested
Reviewed Pantex RCRA Facility Investigation Report GROUNDWATER (March 2004)	June 22, 2004
Submit draft comments to STAND for review and comments	June 22, 2004
Submit final comments to STAND for submission to the Texas Commission on Environmental Quality	June 30, 2004

**Estimates for Next Month**

**Hours:** none

**Dollars:** none

## TECHNICAL PROGRESS REPORT

Mavis Belisle / STAND Contract No. 1

Technical Advisory Services for STAND

May 1 – May 31, 2004

**STAND TAG Project Director:**

Pamela S. Allison

**Effective Date:**

May 4, 2004

**Completion Date:**

August 31, 2004

### Summary of Activities for the Current Month

Review and provide comments on the *Final RCRA Facility Investigation Report, Independent Sites at USDOE Pantex Plant (January 2004)*.

Date

Hours

5/5

(b) (4)

5/6

5/7

5/9

5/10

5/11

5/12

5/14

5/15

5/17

5/18

5/19

5/20

5/22

5/23

5/24

5/27

Total Hours =

Fee = (b) (4)

### Problems Encountered and Remedial Actions Taken

- None.

### Anticipated Activities for Next Reporting Period

- Continue reviewing the Independent Sites RFI.

### Project Milestones

Task	Completion Date
Discuss overview of technical concerns and inadequacies of the RFIR to STAND representative, P. Allison.	May 30, 2004
Complete my review of the RFIR and provide written comments to STAND for submission to EPA and TCEQ.	in progress

### Estimates for Next Month

Hours:

(b) (4)

Dollars:

(b) (4)

# TECHNICAL PROGRESS REPORT

Mavis Belisle / STAND Contract No. 1

Technical Advisory Services for STAND

June 1 – June 30, 2004

STAND TAG Project Director:

Pamela S. Allison

Effective Date:

May 4, 2004

Completion Date:

August 31, 2004

## Summary of Activities for the Current Month

Review and provide comments on the *Final RCRA Facility Investigation Report, Independent Sites at USDOE Pantex Plant (January 2004)*.

<u>Date</u>	<u>Hours</u>
6/1	(b) (4)
6/2	
6/3	
6/4	
6/8	
6/9	
6/10	
6/11	
6/14	
6/15	
6/16	
6/22	
6/23	
6/24	
6/25	
6/28	
6/29	
6/30	
Total Hours =	
Fee =	(b) (4)



### Problems Encountered and Remedial Actions Taken

- None.

### Anticipated Activities for Next Reporting Period

- Continue reviewing the Independent Sites RFI.

### Project Milestones

Task	Completion Date
Continue my review of the RFIR and draft written comments to be provided to STAND for submission to EPA and TCEQ.	in progress
Finalize and provide written comments to STAND for submission to EPA and TCEQ.	July 10, 2004 (or before)

### Estimates for Next Month

Hours:

(b) (4)

Dollars:

(b) (4)



# STAND

14 AUG 10 11:06:03  
U.S. DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

July 16, 2004

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2004

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STAND  
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Amarillo, Texas 79109

Phone: (806) 358-2622  
Fax: (806) 355-3837  
email: [stand@arn.net](mailto:stand@arn.net)

Jackie Hardy, Division Director  
Texas Commission on Environmental Quality  
MC-127  
PO Box 13087  
Austin, Texas 78711-3807

**Re: Final RCRA Facility Investigation Report  
Independent Sites at USDOE Pantex Plant, January 2004**

Dear Ms. Hardy:

Enclosed please find STAND's comments based on its technical review of the above named document. This document was submitted to the Texas Commission on Environmental Quality earlier this year for acceptance on an expedited schedule.

STAND believes that DOE has not met the standard of describing the extent of contamination at these independent sites at Pantex. Should you decide to approve closures based upon the information provided by DOE in its investigation, STAND believes RRS3 closures are appropriate for all sites for which closure is warranted, with the exception of one site (SWMU106, for which RRS2 may be appropriate).

We appreciate your considering community input in the ongoing cleanup efforts at Pantex. STAND believes strongly that community involvement, and a careful consideration of ideas is the strength of human health and safety when you consider these important decisions.

If you have any questions about these comments, please let me know. I can be reached at (806) 358-2622.

Sincerely,

*(Signed Original)*

Cletus G. Stein  
President

Enclosures

CC: Robert Musick, TCEQ, MC-127 - Austin  
Ms. Camille Hueni, Superfund Division, Texas Section (6SF-AP), USEPA R-VI

## Conclusions

DOE did not define the “nature and extent” of contamination for the independent sites for which closure was requested in its *Final RCRA Facility Investigation Report, Independent Sites at USDOE Pantex Plant* (January 2004).

Based upon the data provided by DOE and STAND’s review of this document,

- RRS2 closure may be appropriate for SWMU 106 (Vehicle Maintenance Facility)
- RRS3 closures should be applied to the remainder of the sites for which closure actions are warranted – if TCEQ and EPA agree that DOE’s characterization work is adequate upon which to base a sound determination.
- All sites, with the exception of SWMU 106, should be carried forward into the Risk Assessment process.
- All sites, with the exception of SWMU 106, should be adequately monitored for the foreseeable future, so that when contaminants make their way through the environment, they can be detected, evaluations made, and actions taken to address them in a timely manner.

DOE should reexamine and re-evaluate all of its data related to these sites, so that the public can be assured that closure decisions were sound and not founded on incorrect RRS1 and RRS2 Action Levels (ALs). [See Appendix A, attached, for some examples of DOE’s inaccurate application of RRS ALs.]

TCEQ, EPA, and DOE should also assure the public that no data have been thrown out without justification, for reasons such as

- for what DOE terms “twinning” which are scientifically indefensible,
- under assumptions that DOE has cleaned up “hot spots” for which DOE’s original data were inadequate to identify such spots,
- because DOE believes that it never used a particular contaminant, for which it has not demonstrated this fact (such as Pesticides or Herbicides), and/or
- because DOE believes that it should not be held accountable for a particular contaminant because it is “naturally occurring” (such as Fluoride, used in its weapons and disposed of at the Burning Grounds and Firing Sites).

## Outstanding Issues

### Pratt Lake as an Uninvestigated Recipient of Contaminants

Although Pratt Lake has received stormwater that has flowed over contaminated soils for decades, its surface soils, subsurface, and groundwater have yet to be adequately investigated. Because some of the Sites proposed for closure in the Independent Sites RFIR are in the watershed of Pratt Lake, it is not possible to determine whether or not contaminant pathways have been completed.

## **The Perched Aquifer as Dispersal Mechanism for Contaminants**

Based on the illustration of the potentiometric surface (Figure 3-13), water in the perched aquifer flows outward in all directions, generally from the location of Playa 1. Thus, the crucial question is “Where is the water going?” Possibilities include:

- (1) It could be infiltrating through the intermittent or occasionally thinner FGZ throughout the extent of the perched aquifer;
- (2) There could be “sinks” or low-areas, fracture zones, or other structures, through which the water preferentially leaks;
- (3) The water may be spilling over the edge of the perched aquifer – the extent of which is not full known; or
- (4) Any combination of these.

What the figure suggests, however, is that the perched aquifer is simply spilling over the edges in all directions. Thus, the perched aquifer likely serves as a dispersal mechanism for contaminants from SWMUs to other, otherwise disconnected, areas.

It is important to note that flow in the perched aquifer, as interpreted from the potentiometric surface proposed in Figure 3-13, is to the southwest and beyond the western boundary of Pantex.

If this figure is accurate in its depiction of the boundaries of the perched aquifer, then contaminants from Pantex operations are likely being transported offsite in all directions, and could explain contaminants found in Ogallala wells along the west-boundary and on the Texas Tech property.

## **Errors in DOE’s Evaluation of its Data**

DOE seems to have incorrectly categorized surface soils – designated in its Risk Reduction Action Levels as “upland” soils, instead as “blackwater draw” subsurface units. This error resulted in DOE’s incorrectly identifying sampling results that exceeded RRS1 and RRS2 values – particularly in the metals Barium and Strontium.

For examples that exceeded RRS1 or RRS2 action levels for sites included in this RFIR – yet were not reported as such by DOE – and were not carried forward into the figures identifying the extents of contamination,

- Barium – 16 additional sample results exceeded RRS1
- Barium – 175 additional sample results exceeded RRS2
- Strontium – 238 additional sample results exceeded RRS2.

These errors raise questions about DOE’s evaluation of other data provided in this and other RFIRs.

## **Role of Agriculture – Dispersing Contaminants and Monitoring**

Throughout its evaluation presented in the RFIR, DOE did not address the roles of agricultural activities at Pantex in dispersing contaminants – including the potential impacts from

- modifications of the landscape by farming activities

- disturbances that result from periodic cultivation, which alter infiltration, runoff, and transport of soils and contaminants following precipitation events
- disturbances and transport of contaminants that result from livestock grazing, as well as relocating domestic livestock across or off the site
- lack of effective vegetative covers from season to season
- access by farmers/ranchers and Texas Tech Research Farm employees to remote areas, including some of these independent sites

DOE should not be allowed to hide its own industrial uses and disposition of chemicals – such as pesticides and herbicides – behind the claim that these were merely agricultural chemicals used by farmers. This approach ignores DOE’s responsibility of oversight of agricultural activities on the federal property.

If TCEQ and EPA decide that DOE should be exempted from responsibility of “typical chemical uses of the time by farmers,” then DOE should be required to demonstrate that the chemical uses on Pantex Plant does fit that definition, and that DOE did not use or dispose of these wastes itself.

An additional concern is that DOE has allowed farming and ranching activities at some of these sites in the past, without monitoring to assure that human health has not been adversely affected. Will there be limitations about the land-use practices at these sites, or will requirements for monitoring of agricultural commodities produced on these and/or adjacent areas be imposed?

See Appendix B for a 1995 illustration of agricultural activities, which DOE provided to the public in the past. DOE provided no current illustration in this RFIR.

### **Lack of Experimental Design**

DOE had no apparent experimental design for determining sampling locations at each of the sites included in this RFIR. Thus, DOE extrapolated and made conclusions that were not justified and defensible. On the other hand, had DOE conducted its sampling with an adequate experimental design, it would have been able to draw some conclusions about its sampling results.

In the absence of a good experimental design, DOE could have conducted adequate sampling and analyses at each depth – including collecting an adequate numbers of samples across each site, adequate numbers of samples at various depths (instead of a single sample for some large sites), and request reliable analyses from a competent laboratory that meets or exceeds the requirements and quality to allow evaluating the contaminants. DOE, then, may have been able to draft a competent report that brought this information together in a concise and coherent way, enabling the regulators to draw basic conclusions. To have done this required a good-faith effort on the part of DOE. It would have gone a long way to relieve concerns by DOE’s neighbors and the public.

### **Stand-Alone Document Not Achieved**

DOE’s response to the TCEQ comment (page 2-46, paragraph 3.b.) to produce a stand-alone document was not accomplished, and based upon the directives in the document referring the reader to the Burning Ground RFIR and other RFIRS, may not have been attempted.

It is much more time-consuming to review a poorly summarized RFIR than one in which the well numbers and complete data set in electronic form are readily available and supportive of the RFIR. Given the short-review time, perhaps DOE lacked the time to compile a quality document, or was relying upon the regulators to lack the time to adequately evaluate it.

### **Unaccounted Independent Sites**

Table 5.0-1 provides the disposition status of a number of closed and active SWMUs and AOCs. Several sites, however, were not listed on the table, including SVS1 (denuded area near Playa 1); SVS2 (Zone 11 parallel depressions); SWMU 67/SVS3; SVS4; and all sites in the former AL-PX-12 and ADS1198. What is the status of these sites? Will the TCEQ and/or EPA assure that all identified sites have been adequately characterized, or is it DOE's responsibility to do so?

### **General Comments and Observations**

1. The quality of the data reported in the document (99.26% without blanks contamination) does not seem to be in line with data we have reviewed (based on groundwater) in which 40-51% of the data were disqualified due to contamination of the blanks.
2. Disregarding herbicides excludes the activities of Pantex Operations in which herbicides were used within the complex, along roadsides, or disposed of through ditches or at landfills.
3. DOE provided no records of pesticide and herbicide use at Pantex (1) by Pantex operations, and (2) by Texas Tech Research Farms or the tenant-farmers – with which to evaluate this group of contaminants. Were agricultural chemicals applied at Pantex in concentrations and ways that conformed to the typical uses of farmers off-site at the time? Unless shown to be the case, these chemicals as contaminants should be the responsibility of DOE for cleanup.
4. DOE did not justify its relying on data based on high PQLs. The ITRD recommendation to determine/evaluate site-specific PQLs for the Ogallala Aquifer would have resolved this problem, but was not funded by DOE.
5. Nitrates, Nitrites, Calcium, Fluoride, Potassium, Magnesium, and Sodium were “excluded” without any justification as “naturally occurring.” Although naturally occurring, these constituents at some level of concentrations are, in fact, contaminants. Fluoride, especially, is a known constituent of weapons and potential contaminant at the Burning Ground. These constituents should not be excluded.
6. Stormwater outfalls (shown in Figure 5.4-1) were inadequately identified for Pratt Lake and Playa 3. There are ditches and culverts that could have, and should have, been monitored for Pratt Lake, and additional rivulets and ditches for Playa 3.
7. DOE did not identify the well numbers for perched and Ogallala wells that it considered supporting its premise that there are no contaminant pathways from any of the Independent Sites as reported in this RFIR.
8. Locations of SWMUs are not provided on all figures (for example, where is SWMU 76 on the Figure 5.4-1?).

9. Conflicting information persists in the RFIR. For example, Section 5.1.3.1 (p 5-17) contradicts Section 5.1.3.4 (p 5-19) about the landfill at Firing Site 1 (FS-1). Section 5.1.3.1 states that the landfill at FS1 does not exist, and thus DOE requests an administrative closure. In contrast, Section 5.1.3.4 states that an unlined landfill existed near the FS-1 building or at FS-10, and both sites were investigated to resolve the question.
10. If DOE has decided that the landfill above “does not exist”, then other information (based upon historical knowledge and unpublished employee interviews) regarding landfill locations, extent, and wastes placed into landfills would also be in question. Additional investigation should be required to justify.
11. Page 5-40 “interplay areas do not provide recharge to the perched aquifer” is not an accurate and true statement. The ditches and other excavation activities (including farming) have modified the landscape and act as or provide preferential pathways for infiltration.
12. DOE reports that it had “no sediment” with which to monitor. This is not correct. DOE had the opportunity to create collection points (sediment traps) for sediment resulting from runoff from the various SWMUs. DOE did not do so.
13. The area Pantex refers to as the “playette” at Playa 3 is part of Playa 3, should be included in SWMU 8, and should also have been investigated. DOE provided no sampling locations or analytical results to suggest it has done so.
14. DOE conducted no air monitoring at any of the sites from which to determine the impact of blowing surface particles to adjacent or off-site areas.
15. DOE provided no discussion as to where the landfill “covers” (soils or sediments) were collected at the time the landfills ceased to operate. This soil cover may have resulted from Pantex’ maintenance of the ditches and/or Playa 1.
16. The perched aquifer is used for Drinking Water at the neighbor on the (b) (6) property, adjacent and north of Pantex boundary.
17. DOE used RRS2 Groundwater Standards for Industrial uses as “background” when evaluating Surface Water for the sites evaluated in this RFIR. DOE provided no justification for this action, and it should not be acceptable.
18. DOE’s figures that provide the conceptual contaminant pathways are inadequate and misrepresent the data.
19. The use of the land in the future may not be what DOE “intends” it to be. According to discussions several years ago with Thomas Edwards of the Texas Attorney General’s office, there has been no action in which future land use has been enforceable. Please contact the AG office for a definitive legal declaration on this. If this is the situation, then DOE’s cleanup must consider residential and agricultural uses in the future.
20. Firing Sites that once existed no longer exist. Were these sites adequately identified through the historical knowledge and employee interviews? If so, were they adequately investigated and characterized?

## **Specific Comments**

*(quoted statements are from the Pantex Plant Independent Sites RFIR)*

### **Executive Summary**

#### **page ES-4, Soil Gas**

“Soil gas at Landfill 13 is limited to detected compounds below the theoretical concentration required to impact groundwater above the groundwater PQL. Landfill 15 soil gas results contained ACE, MEK, and XYLO at concentrations that would impact groundwater to above the Groundwater RRS 1 AL. These results were explained as anomalous in the Phase 3 Conceptual Model for Burning Grounds Soil Gas (Stoller 2001b).”

No explanation as to why DOE believed the results were anomalous was provided. DOE should not simply label data as anomalous and remove them from the data set unless it can demonstrate that sampling errors, laboratory errors, or other errors caused them to be invalid.

#### **page ES-4, Groundwater**

DOE’s conclusion that “the Independent Sites soil is not contributing to the perched aquifer contamination” was not supported by adequate sampling and analyses. Some of the data that were collected suggested otherwise, such as bis-2ethylhexyl phthalate at a depth of 149.8 ft, which exceeded RRS2 AL (1.8 mg/kg at PTX01-1001[*Burning Ground RFIR, Figure 5.2-17 Attachment*]). The fact that this contaminant was detected in concentrations exceeding RRS2 AL discloses that contaminants were being transported deep into the subsurface.

#### **page ES-4, Surface Water**

“The drainage from the Independent Sites is by sheet flow and can enter drainage ditches only after flowing over well-vegetated areas.”

This statement may be true for some areas; however, large areas adjacent to some of the Independent Sites are cultivated, farmed, and grazed – in which cases there are periods of no effective vegetative covers.

#### **page ES-4, Surface Water**

“Sediments within the collected surface water samples have caused false-positive detections of metals and radionuclides. The exceedances of the ALs for these compounds have been reduced since filtering of samples began.”

DOE did not provide justification for concluding that detections of metals and radionuclides in surface water samples were, indeed, “false-positive.” Instead, the statement that exceedances were reduced by filtering the samples provides evidence that surface water flows were picking up contaminated sediments from the Independent Sites.

#### **page ES-4, Sediment**

Regarding factors at the Independent Sites that have minimized erosion and transport of contaminated surface soils, DOE states that “Areas are generally well vegetated with native grasses” and “Overland sheet flow is the primary mechanism of water transport.”



Areas that are cultivated, farmed, and/or grazed are (at least periodically) not well-vegetated. Also, overland sheet flow does not prevent stormwater from picking up and carrying contaminated soils. In addition, there are additional rivulets at SWMU 8 (Playa 3) and perhaps at other SWMUs, to facilitate stormwater runoff and carry contaminated sediments.

**page ES-5, Air**

No air monitoring was conducted at any of the sites in order to determine the impacts from contaminated soil.

**page ES-5, Conceptual Exposure Model**

“Human use of the areas consists of authorized workers’ foot traffic during periodic sampling of soil gas and groundwater investigative wells.”

Pantex security guards, Texas Tech Research Farm employees, and other farmers have access to some or all of the areas of concern identified in these documents. Their access would be by automated vehicles, tractors, and by foot. Domestic livestock have access to some of these areas, as well.

**page ES-5, Conceptual Exposure Model**

“No mechanisms of contaminant transport to the perched aquifer have been identified.”

It would seem that mechanisms for contaminant transport might include:

- Old homestead wells: At SWMU 8 (Playa 3), near the Burning Ground, a homestead well known to exist had not been located or plugged. Thus, a preferential pathway may exist. Other old homestead wells have not been identified; some of these wells may be in the vicinity of the sites of concern.
- Recently drilled wells: DOE has plugged an Ogallala well (PTX01-1003) because it believed it was providing a preferential pathway to the Ogallala Aquifer.
- Infiltration and transport times more rapid than previously believed: DOE’s conclusion based on groundwater modeling in May 1999 was that contaminants would not reach the Ogallala Aquifer for some 700 years (as reported to the Pantex Plant Citizens’ Advisory Board). That same month, samples were collected that confirmed that contaminants had already reached the Ogallala Aquifer at the Burning Ground (through a previously unidentified mechanism).
- Agricultural activities, in the vicinities of some of these sites of concern, increase infiltration rates and the opportunities for contaminants to move into the subsurface.

**page ES-5, Closure Statement**

“... all the Independent Sites to be closed to RRS 2” and “This closure statement applies to all environmental media other than perched groundwater, which is addressed in the Groundwater RFIR.”

DOE has not made the case that the Independent Sites should, justifiably, be closed to RRS 2. Although this may be appropriate for some of the Sites, DOE did not conduct adequate sampling and appropriate analyses to provide a defensible case.

For example, determinations of the nature and extent of contamination were often made based on

- few samples, predominantly at the surface (see Table 1, below);
- samples that had not been analyzed for the particular contaminant of concern; and
- analytical results with Minimum Detection Limits (MDLs) that exceeded the action levels. Thus, DOE's conclusion of the nature and extent of contamination was based on those few samples in which the concentrations of contaminants detected in the samples exceeded the excessively-high MDL, and described little about concentrations that may have exceeded background or action levels.

#### **Disagreement between Table ES-1 and Figure ES-3**

The Sites identified in Table ES-1 as "Sites Proposed for Closure in this RFIR" (pages ES-1 and 2) are not in agreement with the sites listed as sources in Figure ES-3. For example, SWMU 8 (Playa 3) is not listed at all, and Sites FS-1, SWMU 58, SWMU 62, and No. 8 are all listed on Figure ES-3 as "Closed Independent Sites." Each of these sites is identified in Table ES-1 as "Sites Proposed for Closure in this RFIR."

## **Specific Comments Nature and Extent**

### **RRS 1 Action Levels**

“The nature describes the range of concentrations for each compound detected. The extent is defined to RRS 1 action levels (ALs).” This is not correct regarding surface water. In fact, DOE reports that

“In evaluating data from outfalls other than Outfall 001, where new data are no longer being collected, the 1999 RRS 2 GW-Ind is used as the decision level basis if action levels are not specified in permits. COPCs that are above the decision level are treated as RRS 1 AL exceedances in this RFIR.” (page 9-10, paragraph 2, Independent Sites RFIR)

### **Incomplete, Inconsistent, and Conflicting Information**

Figure 3-3 is not in agreement with Table ES-1 – for example, Figure 3-3 illustrates FS-1 as green (site closed) and Table ES-1 describes FS-1 as “Proposed for Closure in this RFIR”. Also, SWMU 62, SWMU 139, and No. 8 are not illustrated on Figure 3-3. (SWMU 62 is labeled “does not exist” but it would be helpful to know where it was reported to have been).

Figure 3-3 does not accurately illustrate SWMU 8 (Playa 3). This illustration includes a little over half of the playa.

### **Inadequate investigation of Groundwater impacts (Figure 3-10)**

No groundwater wells (perched or Ogallala Aquifer) have been installed to monitor some of the Independent Sites – SVS 6, SWMU 63, SVS 7a, SVS 7b, SWMU 11, SWMU 14, SWMU 53, and SWMU 73.

Also, no perched groundwater wells have been installed to monitor SWMU 66. No Ogallala groundwater wells have been installed to monitor SWMU 106.

### **Perched Aquifer Saturated Thickness (Figure 3-12)**

The perched aquifers beneath Playa 3 and SWMU 64 are portrayed as being shallow and small in areal extent (and defined by local groundwater wells).

The Pratt Lake perched aquifer saturated thickness is defined by Pantex-site wells only. Thus, this illustration may be inaccurate since DOE has no investigative wells in the perched at Pratt Lake.

### **Perched Aquifer Saturated Thickness suggests recharge/contaminants (Figure 3-12)**

The reported depths of the perched aquifer in the vicinity of Pratt Lake center on the area of the Old Sewage Treatment Plant and the artificial “tail-water pit” which DOE dug to hinder

stormwater flow from leaving the plant-site. Sources of infiltration are likely the tail-water pit, ditches that drain the area of soils contaminated with depleted-Uranium, and the playa itself.

**page 4-10, section 4.2.3.1 Generic Field Operations Plan**

“The QAPP sets DQOs for the ER project to meet the goals of site...”

Groundwater data in recent years (Rice and Allison, 2004) have shown a phenomenal high percentage of samples disregarded due to contaminants in the blanks. How or why have the sampling data contained herein met a higher standard (less than 0.74% of samples were compromised due to contaminants in blanks)?

**page 4-12, section 4.2.3.3 Precision**

Data reportedly used were from February 2001 to November 2003, although valid data exist for time periods prior to this time period. DOE did not explain why prior data were excluded, a concern considering that groundwater MDLs were elevated by DOE for this latter time period.

**page 4-14, section 4.2.4 Determination of COPCs**

“The use of the 95/95 UTL test is considered a conservative approach for determining background ...”

DOE did not support this conclusion with an explanation or reason. TCEQ’s acceptance of the background concentrations (USDOE 2002a\*) was based on a re-evaluation of the data. What are the new values accepted in this re-evaluation? Did DOE incorporate the new values in its evaluations?

**page 4-14, section 4.2.5 Definition of Nature and Extent of COPCs**

“Spatially uniform analyte concentrations marginally above the RRS 1 ALs that appear to be a part of the background population ...”

DOE has reported its determination of “background” to the TCEQ in prior reports, many determinations that are higher than what a reasonable person might conclude. DOE should not be allowed to indiscriminately – in this and other investigations – enlarge the concentrations that have been accepted as “background”.

**page 4-14, section 4.2.5 Definition of Nature and Extent of COPCs**

“Anthropogenic sources not related to operations at the Plant.”

The extent or proposed sources “not related to operations at the Plant” are not identified. What are these proposed sources?

If these sources relate to agricultural activities on-site, then DOE should provide an accurate listing of what chemicals (pesticides, including herbicides, insecticides, and others) have been used on-site, in what concentrations, so that the TCEQ can determine whether or not agricultural chemicals should be excluded as being consistent with agricultural activities used by farmers/ranchers off-site. In addition, DOE should provide an accurate listing of agricultural

chemicals, and locations of applications, used by Plant Operations throughout the plant-site, so that TCEQ can determine which activities are in fact Pantex-related and which are not.

**page 4-15, section 4.2.5.1 Detection Limits**

The changes in the RRS 1 ALs from the 1999 to the 2002 Risk Reduction Rule Guidance were mandated primarily to lowering of the Practical Quantitation Levels (PQLs) and have no, otherwise, relationship to “background.” The presence of the organic chemicals listed – HE, PCB, Pesticides, SVOCs, and VOCs – in any concentrations, reflects contaminants.

**Table 4-2**

What units are used for concentrations? These were not disclosed.

What was the purpose of the data included 5<sup>th</sup> column (Percent of 1999 RRS 1 AL)? This was unclear.

What quantities (or percentages) of the data used in this RFIR, based on 1999 RRS 1 AL, exceeded the 2002 values? This information would allow the reader to better understand the problem created by the lower ALs, but was not provided.

**page 4-15, section 4.2.5.1 Detection Limits (or PQL vs MDL)**

The PQL established by DOE for Pantex is reportedly herein “approximately five times the laboratory MDL.”

Has TCEQ accepted this quantification? DOE provided no justification for the values in this (what was supposed to be) stand-alone document.

DOE states that the maps provide the sampling location and the deepest occurrence of the elevated detection limit. However, DOE’s maps do not provide the reviewer the deepest occurrence at which the location was sampled. Thus, the map may show 5 ft bgs as the deepest occurrence of the elevated detection limit, when 5 ft bgs was the deepest sampling point for this location. This results in a false perception of the adequacy of sampling and characterization of the site. (See tables 1 and 2, as follow, which list sampling locations, depths sampled, and the number of samples collected at each location and depth for one of the sites included in this RFIR – SWMU 8).

**Table 1.** Number of samples collected at each location and depth at SWMU 8 (Playa 3).

Sampling Locations	0 ft	1 ft	2 ft	3 ft	4 ft	4.9-5 ft	Notes
PTX01-1002	1			1	1	1	
ST-BG/02-0266							no results found
PTX08-2033	1					1	
ST-BG/02-0265	1						
PTX08-2034			1				
PTX08-2035	1					1	
ST-BG/00-0004	1						
PTX08-2036			1			1	
PTX08-2037			1			1	
PTX08-2038			1			1	
PTX08-3880		1	2				
PTX08-3881		1					
ST-BG/02-0263	1						
PTX08-3885		1					
PTX08-3886		1					
ST-BG/02-0264							no results found
PTX08-4175		2					
PTX08-4180		2					
PTX08-4181	1	1					As, Cr-6, Pb, Se (only)
PTX08-4182	1	1					As, Cr-6, Pb, Se (only)
PTX08-4183	1	1					As, Cr-6, Pb, Se (only)
PTX08-4185		2					
PTX08-4189	1						As (only)
PTX08-4190		2					
PTX08-4191	1						As (only)
PTX08-4192	1						As (only)
PTX08-4193	1						As (only)
PTX08-4194	1						As (only)
PTX08-4195		2					
PTX08-4200		2					
PTX08-4205		2					
PTX08-4210		2					
PTX08-4215		2					
PTX08-4220		2					
PTX08-4225		2					
ST-BG/00-0187	1						TATB, Ba, Perchlorates (only)
ST-BG/00-0188	1						TATB, Ba, Pest, Perchlorates (only)
ST-BG/00-0215	1						TATB, Ba, Perchlorates (only)
ST-BG/00-0216	1						TATB, Perchlorates (only)
ST-BG/02-0268	1						Ba, Sr, Tl (only)
ST-BG/02-0269	1						Ba, Sr, Tl (only)

**Table 2.** Number of samples collected at each location and depth greater than 5 ft below ground surface at SWMU 8 (Playa 3).

Locations Sampled	10 ft	19.8- 20 ft	29.6- 31 ft	49.6 ft	69.6 ft	99.6 ft	149.6 ft	199.6 ft	249.7 ft	275.8 ft
PTX01-1002	1	1	1	1	1	1		1	1	1
ST-BG/02-0266										
PTX08-2033	1	1	1							
ST-BG/02-0265										
PTX08-2034			1							
PTX08-2035	1	1	1							
ST-BG/00-0004										
PTX08-2036	1	1	1							
PTX08-2037	1	1	1							
PTX08-2038	1	1	1							
PTX08-3880										
PTX08-3881										
ST-BG/02-0263										
PTX08-3885										
PTX08-3886										
ST-BG/02-0264										
PTX08-4175										
PTX08-4180										
PTX08-4181										
PTX08-4182										
PTX08-4183										
PTX08-4185										
PTX08-4189										
PTX08-4190										
PTX08-4191										
PTX08-4192										
PTX08-4193										
PTX08-4194										
PTX08-4195										
PTX08-4200										
PTX08-4205										
PTX08-4210										
PTX08-4215										
PTX08-4220										
PTX08-4225										
ST-BG/00-0187										
ST-BG/00-0188										
ST-BG/00-0215										
ST-BG/00-0216										
ST-BG/02-0268										
ST-BG/02-0269										

**page 4-22, section 4.2.9 Uncertainty of Data**

There was no apparent experimental design in preparation for establishing sampling locations, which would have allowed DOE to draw some conclusions. Thus, DOE's few samples cannot be

expected to be representative of each SWMU. For example, at SWMU 8 (Playa 3), a single location sampled in the subsurface for depths greater than 30 ft bgs is proposed to represent the nature and extent of an entire playa lake. This is not possible, and should not be accepted.

### **Hot-spot Removals**

Hot-spot removals would only succeed if adequate characterization had been done in order to identify accurately those “hot-spots.” DOE did not adequately sample and analyze samples so that “hot-spots” could have been identified.

### **Table 4-1 Action Levels**

Is Table 4-1 accurate, based upon DOE’s current analyses of its background data set?

## **Section 5.0 – Independent Sites Contamination Characterization**

### **Figures Missing**

Figure 5.0-1 (listed in Table of Contents) and 5.4-7 (mentioned in text, but not listed in the Table of Contents) were not found in the document.

### **page 5-1, Section 5.0, Independent Sites Contamination Characterization**

“Landfill 11 was determined during a field investigation not to exist, and documentation supporting a request for closure is presented in Appendix F...”

DOE seems to have determined that the landfill doesn’t exist at the location at which they investigated.

### **page 5-3, Section 5.0, Independent Sites Contamination Characterization**

“... surface water COPCs are evaluated based on ... permits.”

DOE did not provide copies of the permit requirements or discharge limits in this stand-alone document.

### **page 5-3, Figure 5.4-1**

Some of the SWMUs are shown on the illustration; some are not. DOE did not explain why some were included and others not. The figure should accurately display all SWMUs.

### **page 5-22, Section 5.1.4.3, Recent Investigations – *Inconsistent and Incomplete Information***

“Soil gas samples were collected from Ogallala Aquifer investigative wells located adjacent to Landfills 13 and 15. Landfill 13 also had samples collected from perched aquifer wells. These samples were collected ... Data ... are analyzed in detail in the appropriate landfill section.”



The statements in Section 5.1.4.3 are inconsistent with those in sections 13.2.2 and 14.2.2, as follows:

**page 13-4, Section 13.2.2, Soil Gas COPCs**

“Soil gas was not investigated as part of this RFIR. Analyses and data interpretation of soil gas impacts to subsurface soils and the perched aquifer were addressed in the Burning Grounds RFIR ...”

**page 14-3, Section 14.2.2, Soil Gas COPCs**

“Soil gas was not investigated as part of this RFIR. Analyses and data interpretation of soil gas impacts to subsurface soils and the perched aquifer were addressed in the Burning Grounds RFIR ...”

**page 5-22, Table 5.2-1 Soil COPCs for Independent Sites**

DOE did not provide the number of samples collected for each COPC at which depths, which would have allowed the reviewer to put the number of exceedances in perspective.

DOE did not provide exceedances separately for the Upland soils, Ditches, and Blackwater Draw samples. DOE should be required to do so.

**page 5-28, Table 5.2-2 Surface Water COPCs for Independent Sites**

DOE presented Playa 4 as having “No COPCs” but provided no justification for this statement. Because Playa 4 received industrial wastes from parts of Zone 11 and Zone 12 for the duration of Pantex operations, this statement seems inaccurate.

**page 5-3, Nature and Extent of Contamination**

DOE had no apparent experimental design for determining sampling locations at each of the sites included in this RFIR. Thus, DOE extrapolated and made conclusions that were not justified and defensible.

In the absence of a good experimental design, DOE could have conducted adequate sampling and analyses at each depth – including collecting an adequate numbers of samples across each site, adequate numbers of samples at various depths (instead of a single sample for some large sites), and request reliable analyses from a competent laboratory that meets or exceeds the requirements and quality to allow evaluating the contaminants. DOE, then, may have been able to draft a competent report that brought this information together in a concise and coherent way, enabling the regulators to draw basic conclusions. To have done this required a good-faith effort on the part of DOE.

DOE provided no summary tables of the number of samples, at which depths, based on adequately low detection limits, upon which a reviewer would be able to review this document.

DOE provided inaccurate RRS1 and RRS2 action levels in its spreadsheets of data, from which it drew together its nature and extent summary tables. Thus, the tables are inaccurate and demand much time in order to determine the true summaries. (Examples of this are included in detail in comments specific to the SVS6 site; however, they occur throughout the sites included in this RFIR.)

DOE excluded data that, based upon the analyses it had contracted to be done, should have been considered as potential contaminants – including a variety of metals such as Fluoride, Iron, and Magnesium. DOE should be required to re-evaluate these constituents as potential contaminants.

DOE should have been required to screen for every class of contaminants, although based upon the text provided in this RFIR, it did not. Examples include perchlorates, PCBs, and herbicides.

DOE did not provide all of the sites on its Figures, misidentified some sites proposed for closure in this document as “closed” (example: Figure 5.4-1 shows sites SWMU 62, Unassigned 8, and FS-1 color-coded as green [closed] and yet requested that they be included for closure in this document [thus, they should have been color-coded blue]).

**page 5-31, Section 5.3.1.6 Pesticides**

DOE did not present information justifying its disregarding pesticide contamination as an artifact of agricultural practices. DOE should be required to do so, or else should include any pesticides contamination as the result of its own operations.

DOE did not present information as to the migration potential or the break-down products that result from organic contaminants it found in its sites. DOE should be required to do so – a table would be helpful.

**page 5-33, Section 5.3.2 Nature and Extent of Soil Gas Contamination**

DOE should be required to clarify (given the contradictory statements about soil gas studies) whether or not soil gas investigations were done and, if so, where. DOE should be required to present the findings in a coherent way.

**page 5-34, Table 5.3-6 Surface Water COPCs for the Independent Sites**

DOE’s table includes the column heading “Maximum Detected Value in Soil (ug/L)”. DOE should explain the relationship of contaminants in the soil to those in surface water and how it converted these concentrations to ug/L.

DOE should provide a table showing its permit requirements, since it uses those limits as a means to evaluate its contaminants.

DOE provides no period of time over which these samples and exceedances took place. What were the intensities of the rain events?

DOE provided no information about Pratt Lake, which was required in order to evaluate some of the sites presented for closure in this document.

**page 5-35, Migration Pathways**

“These pathways ... will be fully evaluated in the BRA” is a misleading statement – especially, since DOE states in public meetings that only sites closed to RRS3 will be carried forward for the risk assessment process. Based upon these misleading statements, DOE should be required to carry forward all of its sites, whether closed to RRS3 or not, to the baseline risk assessment.

**page 5-35, Section 5.4-1 Soil Pathway**

DOE failed to include the impacts of

- prairie grass fires, grazing livestock, and cultivation activities that result in blowing dust exposures,
- pathways to the Ogallala Aquifer (which DOE ignores entirely).

**page 5-36, Section 5.4.3.1 Surface Water Runoff and Infiltration**

DOE's claims about "limited infiltration" depend upon a variety of factors which were not provided – such as the quality of the vegetative cover influencing the likelihood of stormwater picking up and transporting contaminants, the variable soil properties across the site, the influence of grazing and cultivation, and the results of known contamination of the perched aquifer which suggest infiltration has, indeed, occurred.

The claim of "little recharge in the inter-playa areas" depends on no ditches, pits, cultivation, grazing, and other actions that are common at Pantex.

**page 5-37, Section 5.4.3.3 Areas Contributing to Surface Drainage**

DOE states that "(T)he entire Pantex Plant drains to either Playa 1, 2, 3, 4, or Pratt Playa"; however, Figure 5.4-1 illustrates that there are other off-site playas to which Pantex drains. DOE should, in addition to summarizing the figure accurately and completely, be required to provide a figure identifying culverts under the roadways surrounding Pantex, which would illustrate other drainage areas.

**page 5-38, Section 5.4.3.7 Tracking COPCs**

DOE should be required to substantiate its conclusion that "sediment (<2 feet bgs) COPCs" can be used to conclude whether or not a pathway is active or has been active in the past. Perched groundwater contamination (which DOE has accepted publicly) suggests that contaminants are much deeper than 2 feet. Thus, unless the industrial discharges have continued to the present-day, this approach is not reliable.

DOE did not report that they had conducted sampling that would have allowed them to track contaminants along the pathway and, thus, conclude whether or not a pathway exists.

**page 5-39, Section 5.4.3.8 Flood Event Evaluation**

DOE excludes discussion about the impacts of cultivated land and "maintained" ditches. DOE provides no support to its conclusion.

**page 5-39, Section 5.4.4 Groundwater Pathway**

Due to DOE's limited investigation of contaminants at the surface and, especially, in the subsurface, its conclusions as to groundwater pathways are unsubstantiated. In fact, its data confirming groundwater contamination is in disagreement with these conclusions.

**page 5-44, Section 5.5.1.11 Soil Closure Summary – Table 5.5-2**

DOE has not included all of the sites it has proposed for closure in this RFIR, such as SWMU 8.

**page 5-45, Section 5.5.4 Closure Summary**

Although DOE states that the summary is provided in Table 5.5-3, there seems to be no such table in this RFIR. DOE should provide.

**page 5-47, Section 5.6.2.1 Geology and Hydrology**

DOE states that the perched aquifer “is contiguous beneath the majority of the Pantex Plant (Figure 3-12).” DOE does not explain how the presence of perched aquifer beneath (but not extending past) some of the landfills included in this RFIR, supports its position that infiltration is not occurring. DOE should be required to explain this inconsistency.

**Figures 5.3-2 and Attachment**

DOE has not included all of the data points exceeding RRS1 and RRS2. This error has, in large part, resulted from DOE’s misapplying the RRS1 and RRS2 action levels to surface soils, in which DOE used levels attributable to “Blackwater Draw” rather than “upland soils” for its evaluation and determination. These errors were carried forward into this Figure and Attachment.

DOE should be required to re-evaluate and correct these errors. Regulators should not make decisions on flawed information.

**Figure 5.4-1 and Attachment**

DOE did not explain why Outfall 017 is the only outfall it has used to evaluate stormwater to Pratt Lake. The location of Outfall 017 suggests that it is the tailwater pit (which DOE used to prevent stormwater flow to Pratt Lake), rather than an outfall that adequately portrays flows that traveled under the road through culverts from large areas of Pantex site to Pratt Lake. DOE should be required to evaluate adequately the stormwater flow to Pratt Lake, as well as the surface and subsurface of this area.

DOE misidentified SWMUs 62, Unassigned #8, and FS-1 as being “closed” and, yet, requested their closure in this RFIR.

**Figures 5.4-2, 5.4-3, 5.4-4, and 5.4-6 and Attachments**

DOE did not address the impacts of

- roadside ditches to Pratt Lake and playas 1 and 2
- other ditches to Playa 3
- ditches regarding infiltration, contaminant transport, and groundwater contamination
- overland flow through ditches as a pathway
- known contaminated perched groundwater to the deeper Ogallala Aquifer

DOE misidentified SWMUs 58, 62, FS-1, and Un-8 as being closed; thus, their roles in the contaminant pathways were not addressed.



**SVS 6**  
**Review of Appendix D (Data on CD)**

**Metals**

Metals for which samples were not analysed (based on data included in Appendix D) include

- Aluminum (Al)
- Boron (B)
- Hexavalent Chromium (Cr-6) and
- Manganese (Mn).

Metals that were analytes, but for which RRS 1 and 2 concentrations were not provided in Table 4-1 (pages 4-2 to 4-4) include

- Beryllium (Be)
- Cobalt (Co) and
- Vanadium (V)

DOE included the data in Appendix D (on CD), in which it evaluated and determined whether individual analyses for metals in SVS 6 exceeded RRS1 or RRS2. DOE also provided the RRS1 and RRS2 values for various soil types in Table 4-1 (pages 4-2 through 4-4 of the RFIR). These values do not agree.

If Table 4-1 provides accurate levels for RRS2, then DOE has failed to include concentrations that exceed RRS1 or RRS2 levels for the following metals:

- Barium (10 results exceed RRS1 and RRS2)
- Copper (5 results exceed RRS1)
- Nickel (1 result exceeds RRS1)
- Selenium (1 result exceeds RRS1)
- Strontium (15 results exceed RRS2).

It is not clear how DOE determined whether surface soils were “upland” or “Blackwater Draw” soil types. It would seem that all surface soils (0 ft depths) would be “upland” soils, if not in a ditch or playa. If this is the case, then other values for the above (and perhaps other) metals also exceed RRS2 and have not been identified.

These metals concentrations exceed RRS1 or RRS2; however, these exceedances have not been included in the Site-wide Metals Extent Figure 5.3-2 nor in the listing of exceedances provided in the Figure 5.3-2 Attachment.

These errors occur in the evaluations of most of the sites presented by DOE in this RFIR.

**Table 1.** Contrasts of RRS1 and RRS2 levels reported in Table 4-1 (pages 4-2 through 4-4) and levels used in Appendix D (data on cd) to identify exceedances.

Upland Soils Metals	Table 4-1		Appendix D (Data on CD)	
	RRS1	RRS2	RRS1	RRS2
<b>Silver (Ag)</b>	<b>0.5</b>	51	<b>2.3</b>	51
Arsenic (As)	11	11	10	10
<b>Barium (Ba)</b>	<b>190</b>	<b>200</b>	<b>1000</b>	<b>1000</b>
Beryllium (Be)	1.7	1.7	2.9	2.9

Upland Soils Metals	Table 4-1		Appendix D (Data on CD)	
	RRS1	RRS2	RRS1	RRS2
Cadmium (Cd)	1.3	1.3	0.41	0.5
Cobalt (Co)	10	610	32	610
<b>Chromium (Cr)</b>	<b>28</b>	<b>28</b>	<b>69</b>	<b>69</b>
<b>Copper (Cu)</b>	<b>16</b>	130	<b>37</b>	130
<b>Mercury (Hg)</b>	<b>0.025</b>	0.2	<b>0.11</b>	0.2
Molybdenum (Mo)	2.9			
<b>Nickel (Ni)</b>	<b>20</b>	200	<b>53</b>	200
Lead (Pb)	18	18	15	15
Antimony (Sb)	13	13	170	170
Selenium (Se)	6.2	6.2	4.3	5.0
<b>Strontium (Sr)</b>	<b>44</b>	<b>44</b>	<b>690</b>	<b>690</b>
<b>Thallium (Tl)</b>	<b>19</b>	<b>19</b>	<b>100</b>	<b>100</b>
Vanadium (V)	54		150	150
<b>Zinc (Zn)</b>	<b>70</b>	3100	<b>160</b>	3100

As you will notice in Table 1, some of the levels reflected in Appendix D are lower than the appropriate levels included by DOE in Table 4-1. However, these inaccuracies or inconsistencies raise questions about the accuracy of DOE's evaluations of its data and DOE's conclusions based upon those evaluations.

Based upon this review, DOE failed to report at least 48 values that exceeded RRS1 or RRS2 for metals Barium, Copper, Nickel, Selenium, and Strontium. DOE reported inappropriately 3 values as having exceeded RRS2 for Cadmium in upland soils, when they did not.

These 3 values were for locations PTX13-2607 (0.73 mg/kg), PTX13-2608 (0.88 mg/kg), and PTX13-2610 (0.61 mg/kg), each of which is below the RRS1 and RRS2 levels of 1.3 mg/kg for upland soils. The latter two locations did have samples at depth that did exceed the RRS2 levels, and were reported by DOE appropriately.

**Table 2.** SVS 6 – Summary of samples, contaminated “blanks”, number and range of detections, and number of samples that exceed RRS1 or RRS2. [Note that RRS1 and RRS2 not provided in Table 4-1 for all metals.]

Metal	Total # Samples	# samples blanks	# samples no detections	# samples with detections	range	# samples that exceed
Silver (Ag)	83		83	0		
Aluminum (Al)	0					
Arsenic (As)	83		0	83	3.2 – 6.5	
Boron (B)	0					
<b>Barium (Ba)</b>	109		0	109	61 – 1770	<b>10 &gt;RRS2</b>
Beryllium (Be)*	83	83 (all)	0	83	0.53 – 1.3	RRS not identified
<b>Cadmium (Cd)</b>	83	83 (all)	76	7	0.48 – 0.88	<b>6 &gt; RRS2</b> <b>1 &gt; RRS1</b>

Metal	Total # Samples	# samples blanks	# samples no detections	# samples with detections	range	# samples that exceed
Cobalt (Co)*	88	60			3.4 – 9.2	RRS not identified
Chromium (Cr)	83	0	0	83	5.3 – 20.6	
Chromium-6	0					
<b>Copper (Cu)</b>	96	6	0			<b>5 &gt; RRS1</b>
Mercury (Hg)	83		83			
Manganese (Mn)	0					
<b>Nickel (Ni)</b>	88	1	0	88	7.3 – 21.2	<b>1 &gt; RRS1</b>
<b>Lead (Pb)</b>	97	0	0	97	4.6 – 20.1	<b>5 &gt; RRS2</b>
Antimony (Sb)*	83	0	83	0		RRS not identified
<b>Selenium (Se)</b>	83	0	81	2	0.46 – 4.7	<b>1 &gt; RRS1</b>
<b>Strontium (Sr)</b>	102	0	0	102	23.2 - 236	<b>15 &gt; RRS2</b>
Thallium (Tl)	83	0	79	4	4.4 - 9	
Vanadium (V)*	83	0	0	83	16.4 – 49	RRS not identified
Zinc (Z)*	83	0	0	83	16.3 – 63	RRS not identified

\* RRS1 and RRS2 values not presented in Table 4-1 (page 4-2 through 4-4)

**Bolded** = results exceeded concentrations established for RRS1 and/or RRS2, but not identified and included in the Site-wide Metals Extent Figure 5.3-2 & Attachment

### Barium

**Table 3.** Barium (Ba) – Number of samples and sampling locations per depth, range of concentrations (in mg/kg), and exceedances of RRS 2, as reported in Appendix D (Data on CD, denoted as “Y” in column S for RRS2).

Depths sampled	# of samples	# of locations	Ranges of concentrations	# exceeding RRS2	Location numbers exceeded	Barium Concentration (mg/kg)
0	37	31	123 – 409	0		
4	18	18	166 – 1250	2	PTX13-2622 PTX13-2608	1130 1250
5	1	1	213	0		
10	22	21	96.7 – 663	0		
13	19	16	88.8 – 433	0		
14	2	2	384 – 1770	1	PTX13-2617	1770
15	5	4	72.9 – 213	0		
20	1	1	61	0		
25	2	2	127 – 182	0		
33	2	2	88.7 - 244	0		

However, when you compare the values presented in Appendix D to Table 4-1 (page 4-3, for this metal), it seems that DOE used the wrong RRS2 values for some of the samples collected from the Upland Soils at the surface.



DOE identifies (as shown in Table 1 above) no exceedances of RRS2 values at the surface (0 ft). However, using the Action Levels DOE reported to be using (page 4-3, Table 4-1) for Barium, there seem to be at least ten (10) exceedances at the surface (as shown in Table 2 below).

**Table 4.** Barium (Ba) – Comparison of concentrations reported in Appendix D (Data on CD) to RRS 2 values reported in Table 4-1 (page 4-3, for Barium), to identify exceedances of RRS 2.

Soil Types at 0' depth	# of samples	Ranges of concentrations	RRS 2* (mg/kg)	Location #s exceeded**	Concentration **
U	28	123-403	200	PTX13-2610 PTX13-2619 PTX13-2620 PTX13-2602 PTX13-2609 PTX13-2601 PTX13-2624 ST-SVS6-0002	239 249 (2 values) 258 283 310 354 369 & 380 403
D	1	126	231		
B	8	240-409	1000	NOTE: If these soils are actually upland soils, then all 8 of these samples > RRS2	

\*\*these exceedances were not identified as exceeding RRS2 in the Site-wide Metals Extent (Figure 5.3-2 and Attachment).

In Appendix D, DOE seems to have used the RRS1 and RRS2 values for “B” soils (Blackwater Draw) to determine “U” soils (upland soils). Comparing the values used in Appendix D to those listed in Table 4-1 (page 4-3) for Barium illustrates the inaccuracies.

DOE has not included these locations and contaminant concentrations (listed above in Table 3) in its Site-wide Metals Extent Figure Attachment nor Figure 5.3-2. In fact, DOE

Eight (8) samples at the surface (0 ft depth) were identified as soil type “B”, which may be the case, but should be clarified. How did DOE determine whether surface soils (0-2 ft depths) were “U” upland soils or “B” blackwater-draw? For some metals, the differences in RRSs for the different “soil types” varies greatly.

These inaccuracies raise the question as to whether these errors are inherent in the entire document and, thus, is a problem for other metals, sampling locations and depths, and at other SWMUs.

## Beryllium

**Table 5.** Beryllium (Be) – Comparison of concentrations reported in Appendix D (Data on CD) to RRS 2 values reported in Table 4-1 (which was not provided, page 4-3 for Beryllium), to identify exceedances of RRS 2.

Depths sampled	# of samples	# of locations	Ranges of concentrations	# exceeding RRS2	Location numbers exceeded
0	21	18	0.66 – 1.3	0	
4	17	17	0.64 – 1.2	0	
10	19	18	0.53 – 1.1	0	
13	19	16	0.63 – 1.2	0	
14	1	1	1.1	0	
15	2	1	0.63 – 0.65	0	
25	2	2	0.84 – 1	0	
33	2	2	0.67 – 1.1	0	

**Table 6.** Beryllium (Be) – Comparison of concentrations reported in Appendix D (Data on CD) to RRS 2 values reported in Table 4-1 (page 4-3, for Beryllium, which was not provided), to identify exceedances of RRS 2.

Soil Types at 0' depth	# of samples	Ranges of concentrations	RRS 2* (mg/kg)	Location #s exceeded
U	13	0.66 – 1.3	not provided	
D	0	none	not provided	
B	70*	0.53 – 1.2	not provided	

Table 4-1 (page 4-3) did not provide the RRS values for Beryllium in soils.

DOE has denoted all (all) samples collected for Beryllium analysis to have had contaminated “blanks”. DOE should be required to resample, and provide more reliable data that do not have some problem with “blanks”.

## Cadmium

**Table 7.** Cadmium (Cd) – Number of samples and sampling locations per depth, range of concentrations (in mg/kg), and exceedances of RRS 2, as reported in Appendix D (Data on CD, denoted as “Y” in column S for RRS2).

Depths sampled	# of samples	# of locations	Ranges of concentrations	# exceeding RRS2	Location numbers exceeded	Cadmium Concentration (mg/kg)
0	3	3	0.61 – 0.88	3	PTX13-2610 PTX13-2607 PTX13-2608	0.61 0.73 0.88
4	1	1	0.63	1	PTX13-2610	0.63
10	1	1	0.68	1	PTX13-2609	0.68
13	1	1	0.71	1	PTX13-2608	0.71
15	1	1	0.48	0	PTX13-2610	0.48 (> RRS1)

DOE seems to have compared the values presented in Appendix D for “U” (upland soils) to RRS 2 levels for “B” (Blackwater Draw) concentrations provided in Table 4-1 (page 4-3, for this metal). However, it is possible that the concentrations provided in Table 4-1 are the values that are in error. DOE needs to correct this inaccuracy.

DOE identifies (as shown in Table 1 above) all of the samples (0 – 13 ft depths) as exceeding RRS2 values and the remaining sample (15 ft) as exceeding RRS1.

Although all samples indicated Cadmium contamination, DOE did not adequately sample the surface or subsurface to identify the extent of the contamination.

Also, DOE reported in Appendix D that all analyses for Cadmium were associated with contaminated “blanks”. DOE should be required to resample, and provide more reliable data that do not have some problem with “blanks”.

### Cobalt

**Table 8.** Cobalt (Co) – Number of samples per depth, number of samples without “blanks” contamination, range of concentrations (in mg/kg), and no exceedances of RRS 2, as reported in Appendix D (Data on CD). Comparative values in Table 4-1 were not provided.

Depth of samples	# Samples	# Samples without “blanks” contamination	Concentration ranges (mg/kg)	Exceeding RRS2
0	26	10	5.2 – 9.2	
4	17	4	3.4 – 8.1	
10	19	4	4.5 – 6.7	<b>RRS2 values were not provided in Table 4-1 (page 4-3)</b>
13	19	6	3.7 – 6.3	
14	1	0		
15	2	0		
25	2	2	5.3 – 5.4	
33	2	2	4.8 – 5.5	
Totals	88	28	3.4 – 9.2	

### Chromium

**Table 9.** Chromium (Cr) – Number of samples per depth, range of concentrations (in mg/kg), and no exceedances of RRS 2, as reported in Appendix D (Data on CD).

Depth of samples	# Samples	Concentration ranges (mg/kg)	Exceeding RRS2
0	21	9.8 – 18.1	
4	17	5.3 – 19.9	
10	19	7.1 – 19.7	<b>none</b>
13	19	6.8 – 20.6	
14	1	14.6	
15	2	8.3 – 8.6	

Depth of samples	# Samples	Concentration ranges (mg/kg)	Exceeding RRS2
25	2	10.2 – 13.4	
33	2	6.8 – 17.2	

DOE's reported action levels (in mg/kg concentrations) for RRS1 and RRS2 as evaluated in Appendix D did not agree with those identified in Table 4-1 (page 4-3).

### Copper

**Table 10.** Copper (Cu) – Number of samples per depth, range of concentrations (in mg/kg), and no exceedances of RRS 2, as reported in Appendix D (Data on CD).

Depth of samples	# Samples	Concentration ranges (mg/kg)	Exceeding RRS1 (16 mg/kg, upland soils)	Concentration
0	17	7.9 – 30.8	ST-SVS6-0003 ST-SVS6-0010 ST-SVS6-0002 PTX13-2610	16.3 16.7 & 17.7 17.6 30.8
4	17	2.5 – 31.1		
5	1	14.5		
10	19	5.4 – 28.6		
13	19	5.6 – 34.2		
14	1	12.4		
15	2	20.4 – 21.4		
25	2	9.6 – 10.2		
33	2	7.6 – 10.5		

DOE identified RRS1 values for Copper (Cu) in upland soils in Appendix D as 37 mg/kg. However, DOE identified RRS1 values for upland soils in Table 4-1 (page 4-3) as 16 mg/kg. Thus, if Table 4-1 is correct, then DOE has inadequately evaluated its data.

DOE has not included any of these locations and concentrations (identified in Table 9 above) in its Site-wide Metals Extent Figure 5.3-2 and Figure 5.3-2 Attachment.

## Strontium

**Table 11.** Strontium (Sr) – Number of samples and sampling locations per depth, range of concentrations (in mg/kg), and exceedances of RRS 2, as reported in Appendix D (Data on CD, denoted as “Y” in column S for RRS2).

Depths sampled	# of samples	# of locations	Ranges of concentrations	# exceeding RRS2	Location numbers exceeded	Strontium Concentration (mg/kg)
0	38		23.2 – 197	0		
4	17		42.4 – 219	0	none	
5	2		54.3 – 223	0	reported	
10	19		106 – 236	0	in	
13	19		69.7 – 227	0	Appendix D	
14	1		200	0	(however,	
15	2		92.3 – 144	0	see Table 12	
25	2		152 – 157	0	below)	
33	2		127 - 135	0		

However, when you compare the values presented in Appendix D to Table 4-1 (page 4-3, for this metal), DOE's values do not agree – instead, it seems that DOE used the wrong RRS2 values for some of the samples collected from the Upland Soils at the surface.

DOE identifies (as shown in Table 1 above) no exceedances of RRS2 values at the surface (0 ft). However, using the Action Levels DOE reported to be using (page 4-3, Table 4-1) for Barium, there seem to be ten (10) exceedances at the surface (as shown in Table 12 below).

**Table 12.** Strontium (Sr) – Comparison of concentrations reported in Appendix D (Data on CD) to RRS 2 values reported in Table 4-1 (page 4-4, for Strontium), to identify exceedances of RRS 2.

Soil Types at 0' depth	# of samples	Ranges of concentrations	RRS 2* (mg/kg)	Location #s exceeded	Concentration > RRS2
U	29	23.2 - 197	44	ST-SVS6-0009 ST-SVS6-0010 ST-SVS6-0003 PTX13-2608 ST-SVS6-0006 ST-SVS6-0002 PTX13-2602 PTX13-2619 PTX13-2620 PTX13-2610 PTX13-2601 PTX13-2609 PTX13-2624	44.3 45.8 46.2 48.3 52.1 54 101 103 & 103 108 136 141 164 195 & 197
D	1	27.5	72		
B	8	77 – 150	690	NOTE: If these soils are actually upland soils, then	

Soil Types at 0' depth	# of samples	Ranges of concentrations	RRS 2* (mg/kg)	Location #s exceeded	Concentration > RRS2
				all 8 of these samples > RRS2	

DOE has not included any of these locations and concentrations in its Site-wide Metals Extent Figure 5.3-2 and Figure 5.3-2 Attachment, even though they exceed RRS2 and should have been included.

## SVS 6 – Contamination Characterization

(page 6-2, Section 6.1) DOE stated that the total area of the landfill pits is ¼ acres; however, DOE should identify the acreage of the entire area considered as the SWMU, including the inter-pit areas. This would allow the reviewer to get a better sense of the adequacy of DOE's sampling and analyses.

(page 6-2, Section 6.1.2) DOE states that a soil gas survey was conducted prior; however, DOE later states that soil gas data were not collected at SVS 6 (page 6-16, Section 6.5.2).

(page 6-2, Section 6.1.3) DOE does not provide a closure date for the landfill. DOE states that the landfill has not received waste since its closure, which raises the question, "Is it common for DOE landfills to receive wastes after they are closed?"

(page 6-3, Section 6.2.3) DOE states that "Surface water from SVS 6 does not discharge directly to Playa 2 through any established ditch... and only ... as sheet-wash..." This statement is not true, in that there are ditches that drain this area that follow the north side of the West-gate road, and that flow under this road through culverts.

Ditch sediments could have been collected through sediment traps, although DOE seems to have decided not to do so.

(page 6-4, Section 6.3.1) DOE reports that data from soil removed through ICMs were removed from the data set; however, it is unclear that the limited number of samples allowed DOE to identify soils that should have been removed. Also, this statement seems in conflict with (page 6-7, Section 6.3.2) which states that no corrective measures had been completed.

(page 6-4, Section 6.3.1.1) DOE's sampling for HE was inadequate due to the large number of samples that failed to meet detection limits required.

(page 6-5, Section 6.3.1.2, Section 6.3.1.4, and Section 6.3.1.5) Because DOE's historical knowledge of many sites has not proven true, it would seem due diligence that DOE sample for herbicides, PCBs, and pesticides in this area to allow it to make these assurances to the regulators.

(page 6-5, Section 6.3.1.3) "SVS 6 is one such area where background concentrations combined with estimated laboratory results reduce the validity of the CD data."

DOE should clarify this confusing statement. Does DOE consider their data invalid?

(page 6-6, Section 6.3.1.6 and page 6-7, Section 6.3.1.7) DOE's samples included too many samples that failed to meet the detection limits needed.

**(page 6-7, Section 6.3.2)** DOE states that no corrective measures have been completed, and yet in **(page 6-4, Section 6.3.1)** DOE states that data were removed based upon corrective measures. DOE should clarify which statement is correct, or explain its confusing statement.

**(page 6-7, Section 6.3.4)** DOE used RRS2-Ind GW values to determine compliance with RRS1 values. This should not be accepted, and the Tables should be updated based upon complete information.

**(page 6-8, Section 6.4)** DOE states that migration pathways “are briefly described... and will be fully evaluated in the BRA”; however, DOE has claimed elsewhere and in public meetings that only sites that are closed to RRS3 will be carried forward in the BRA. DOE should correct this (seemingly) misleading statement, or else carry every site closed to RRS2 forward to the BRA, along with the RRS3 sites.

**(page 6-9 through 6-13, Sections 6.4.1-6.4.4)** DOE has not conducted sampling and analyses adequate to support its conclusions, especially at depths, and fails to seriously consider potential contaminant pathways to groundwater. DOE should be required to do so.

**(page 6-12, Table 6.4-1)** This table indicates that (if assumed that no new releases are occurring), contaminants continue to be carried from some SWMU to Playa 2. DOE has not made the case that this SWMU is not one of the contributing SWMUs.

**An unanswered question** – DOE did not explain where the cover for the SVS6 landfills originated. Because it is so recent in its closure to taking on wastes (1979?), it would seem that DOE has maintained that information. DOE should provide it.

## SVS 7A and SVS 7B

### General Comments

Most of the Independent Sites, proposed for closure at RRS2 (industrial) primarily for soil contamination, are located near areas of the Pantex Plant where agricultural activities take place. While RRS2 closure may be appropriate for some of the sites, food production agriculture is not an appropriate activity for RRS2 or RRS3 sites.

Farming activities involve plowing the land involved two to three times a year, and even in light wind conditions poses risks of spreading soil contamination to other areas of the plant as well as exposing the agricultural workers. Though most plowing is shallow (2-4"), farmers occasionally plow to a depth of 8-10" to improve water retention or for weed control.

In addition, movement of livestock risks carrying contaminated soil from place to place across the grazing areas.

It is our recommendation that steps be taken to assure that human health is not compromised through future activities at or near these contaminated sites. Do the TCEQ and/or EPA require some reasonable perimeter to be established around RRS2/RRS3 sites in which agricultural activities are prohibited – to minimize or prevent the spread of contaminated soils and to reduce risks to both agricultural workers and consumers of agricultural products?

In table 5.0-1, disposition of a number of closed and active SWMUs and AOCs is indicated; however, several have not been included on the table, including SVS1 (denuded area near Playa 1); SVS2 (Zone 11 parallel depressions); SWMU 67/SVS3; SVS4; and all sites in former AL-PX-12 and ADS1198. Please indicate the status of these sites.

### SVS7a

The description of this site indicates that the 12 included landfills were excavated to 15' wide by 7-10' deep, and covered with a minimum of an additional 4' of soil (7.1.1).

In 7.1.2, it also indicates sampling was done to a depth of 10'. Since the bottom of the trenches would have been 11-14' deep, and the trenches unlined, sampling should have been done to at least 1-2' below the base of the trenches.

The description (7.1.2) also indicates a soil gas survey indicating the presence of toluene and xylene above the reporting limit for all Zone 4 magazines. Why is this not evaluated in the closure proposal?

**Tables 7.2.2 and 7.3.3** are the same. Why the duplication?

The statement in 7.4.1 cannot be justified since sampling was done only to 10'.

Statement 7.4.4 should indicate where the analytical data are found.

In **figures 7.3-1 and 7.3-2**, it is indicated that the non-detect limit exceeds RRS1 for HE. If so, how can you tell that the site should be closed to RRS1 for HE?



In **Section 7.5.1**, it is indicated that the site includes 12 “identical” landfills, and that two of the 12 were selected to provide characterization for all 12. Although the two selected provide the outer extremes of the site, there is no justification for the assumption that the sites are identical. There is also no justification for the assumption that the contamination pattern around each site will be identical (Figure 7.5-5), since, according to 7.4.2.2, the site “straddles” two surface water drainage systems. At least one site selected at random should be included in the characterization, and at least one site at or near the division of the drainage systems. Instead of a closure area around each landfill, a single closure area should encompass all 12 sites and some reasonable boundary drawn around them.

In **figure 7.3-3** attachment, sample locations indicate all 21 samples at 10 locations exceeded RRS2 AL for metals (Lead). What is the justification for RRS2 closure with these exceedances? Again, none of the samples were taken from deeper than 10’, which is above the base of the trenches.

**Figure 7.3-4:** See above.

In the **Figure 7.3-4 attachment**, exceedances for lead at 2’ are indicated. Since there was a soil cover of 4’ in thickness, why are there exceedances in the soil cover?

**Figure 7.3-7:** If the non-detect limit exceeds RRS1, what is the justification for closure to RRS1 for SVOCs?

**Figure 7.5-2:** Explanation code is incomplete.

#### **Summary of Nature and Extent**

The nature and extent of contamination is not adequately defined for this site. The maximum sampling depth of 10’, some 1-3’ above the base of the trenches, fails to define the vertical extent. The non-random selection of sites for characterization fails to define the lateral extent. The nature of contamination is also inadequately defined for SVOCs, and the presence of toluene and xylene is inadequately explained or characterized.

#### **SVS7b**

The site (Landfill 21) is described as being in Zone 5 (Section 8.0). The site is described (Section 8.1.1) as being U-shaped trenches around each of 44 magazines, 15’ wide by 7-10’ deep, with at least a 4’ soil cover. The borings referenced at depths of 10 in the soil gas survey (Section 8.1.2) would not have reached the base of the trenches, and cannot be used to determine the extent of the contamination.

There is no indication in 8.0 of how the four characterization sites were selected as “representative” of the 44 sites.

In **Table 8.2-2**, all but one of the metals samples from Outfall 023 exceeded the decision I at least half of all samples. There is no explanation for these exceedances.

In **Table 8.3-1**, there is indication of an exceedance of Barium (BA) at one location. If all sites are identical, what is the explanation for this?

**Tables 8.2-2 and 8.3-4** are the same. Why duplicate?

**Section 8.4.4:** The source for this analytical data should be indicated.

**Section 8.5.2:** The soil gas closure to RRS1 is not justified on the basis of the data.

**Figure 8.3-3 Attachment:** Of the 25 samples shown, 23 exceed RRS2 AL. What is the justification for RRS2 closure for metals? The exceedance for Barium in only one sample at more than three times the AL is not explained.

**Figure 8.3-6 Attachment:** Of the 22 samples shown, six exceed RRS2 AL. What is the justification for RRS2 closure?

**Figure 8.5-2 Attachment:** See Figure 8.3-3 comment.

**Figure 8.5-3 Attachment:** See Figure 8.3-6 comment.

**Figure 8.5-6:** There is no reason to assume the same pattern of contamination around each of the 44 sites, based on characterization of four, especially in light of the anomalies in metals (Barium). The deed recordation should encompass the 44 sites as a whole, with a reasonable protective boundary.

#### **Summary of Nature and Extent**

The nature and extent of contamination are not adequately defined for this site. Sampling to 10' does not reach the reported base of the trenches, so vertical extent cannot be defined. No rationale for the selection of the four sites selected for characterization is given, nor is it certain whether lateral contamination is adequately defined. If Barium is present in one of the four sites characterized, could it be present in 11 of the 44 sites? If not, what is the explanation for its presence at only one site?

## **SWMU 8 – Playa 3**

### **page 9-1, section 9.0 SWMU 8 Contamination Characterization**

DOE was required to rely on the 2002 RRRG document for RFIRs submitted during 2004. It was not clear whether or not this requirement was met and, instead, appears otherwise, since DOE provided no summaries or evaluations in this RFIR supporting closure of this site.

### **page 9-1, section 9.1 Historical Operations**

“The sediments beneath the playa apparently prevent rapid infiltration of surface water (Stoller 2002b).”

This statement does not accurately reflect the playas during and following periods of drought when dessication cracks are extensive, and provide preferential pathways for rapid infiltration of surface water for some period of time.

When was “Disposal of solvents at the site ... discontinued”? DOE did not provide this date.

Although “previous investigations” were reported in paragraph 9.0 to be included in section 9.1, DOE provided no discussion about (1) the presence of a pre-Pantex groundwater well near Playa 3, (2) efforts to locate this well, and (3) whether or not these efforts were successful. The presence of such a well may provide a mechanism for contaminant transport to the perched aquifer.

### **page 9-1, section 9.1.1 History of Waste Managed**

The statement that “Playa 3 has had no direct waste management activities” seems to be overridden by the DOE acknowledgement that the Burning Ground “solvent evaporation pit has overflowed” to possibly contaminate Playa 3, at 500 feet down-slope.

### **page 9-3, section 9.1.3 Source Abatement Measures**

Although “Closure and ICMs of ... the Burning Grounds have reduced or eliminated the influx of contaminants that could impact SWMU 8”, fate and transport of contaminants originating from the Burning Ground and nearby Firing Sites have had ample years to migrate much deeper than the sampling depths.

### **page 9-3, Table 9.2-1**

A table that identified the number of samples from soils and the subsurface, at each identified depth, would have provided more useful information. [See tables 1 and 2 above.]

### **page 9-4, section 9.2.2 Soil Gas COPCs**

What were the results of the soil gas studies at the Burning Ground, relative to SWMU 8? DOE did not provide this information in this document.

**page 9-4, section 9.2.3 Surface Water and Sediment COPCs**

Outfall 030 results provide evidence that releases of High Explosives contaminants to Playa 3 continue (Table 9.2-2). It was notable that results from all 10 of the analyses reported exceeded the Permit limits.

Other rivulets to Playa 3 have not been identified and monitored for stormwater contaminants.

DOE reports that “metals detected in Table 9.2-2 are indicative of naturally occurring compounds, suspended in the stormwater rather than dissolved from source areas”; however, DOE does not provide any reasoning or data that support this premise. How was this conclusion determined? Without that information, it cannot be assumed to be factual.

“No ditch sediment was identified or sampled during this or previous RFIR investigations.” DOE fails to justify this lack of investigation, which would provide some information as to the transport of contaminated sediments at the surface.

**page 9-5 Table 9.2-3**

A table that identified the number of samples from soils and the subsurface, at each identified depth, would have provided useful information.

DOE states that there are no RRS 1 Exceedances below 1 feet. However, DOE reported in the Burning Ground RFIR that 1.8 mg/kg of contaminant bis-2ethylhexyl phthalate at 149.8 ft exceeded RRS2 AL (*Burning Ground RFIR, Figure 5.2-17 Attachment*).

**page 9-5, section 9.3 Nature and Extent of Contamination**

The nature and extent of contamination at SWMU 8 (Playa 3) have not been determined for the following reasons:

No samples were collected from that part of the playa that Pantex representatives (in public meetings) have termed “the playette” (see Figure 9.3-1).

**page 9-5, section 9.3.1 Nature and Extent of Soil Contamination**

Although sampling locations were provided in Figure 9.3-1, DOE provided no listing or summary of the sampling locations, number of samples collected at which depths and for which constituents and contaminants. In fact, no new data were found in the Appendix (on compact disk) in this document; rather, the reader is referred to the Burning Grounds RFIR. Consulting the data (on cd) in the Burning Ground RFIR, however, fails to identify which locations DOE considers relevant to SWMU 8 (Playa 3) itself.

Thus, to view any of the data required compiling a list of sampling locations from this document (taken from Figure 9.3-1). This listing follows in TABLE 3.

I was unable to identify additional data provided by DOE in response to the TCEQ comments, because either the dates samples were collected were not identified or, if additional sampling locations were used, those locations were not identified in the text.

Sampling locations on Figure 9.3-1 that appeared to be the same location were listed together in the following table (Table 3).

**Table 3.** Summary of analyses per location and depths for analytes other than Volatile and Semi-volatile organic contaminants (Burning Ground RFIR).

Sampling Location	Depths Sampled (feet)	Number of Samples	Types of Analytes	Notes or Comments
D				no results found
PLAYA3 SITE1				no results found
PLAYA3 SITE2				no results found
PLAYA3 SITE3				no results found
PLAYA3 SITE4				no results found
PLAYA3 SITE5				no results found
PTX01-1002	0 3 4 4.9 10 19.8 29.6 49.6 69.6 99.6 149.6 199.6 249.7 275.8	1 1 1 1 1 1 1 1 1 1 1 1 1 1	HE, N/N, Met, PCB, Pest, Rad HE, Met, PCB, Pest 3HE, N/N, Met, PCB, Pest HE, N/N, Met, PCB, Pest HE, N/N, Met, PCB, Pest HE, Met, PCB, Pest HE, N/N, Met, PCB, Pest HE, N/N, Met, PCB, Pest HE, N/N, Met, PCB, Pest HE, N/N, Cr-6, F, PCB, Pest, Rad HE, N/N, Cr-6, F, PCB, Pest, Rad HE, Cr-6, F, PCB, Pest, Rad HE, N/N, Cr-6, F, PCB, Pest, Rad HE, N/N, Cr-6, F, PCB, Pest, Rad	
ST-BG/02-0266				
PTX01-1014				no results found
PTX01-1014A				no results found
PTX08-2033	0 5 10 20 30	1 1 1 1 1	HE, Met HE, N/N, Met HE, N/N, Met HE, N/N, Met HE, N/N, Met	
ST-BG/02-0265	0	1	Ba, Sr, Tl	
PTX08-2034	2 30	1 1	HE, Met HE, Met	
PTX08-2035	0 5 10 20 30	1 1 1 1 1	4HE, Met 4HE, N/N, Met 4HE, N/N, Met HE, N/N, Met HE, Met	
ST-BG/00-0004	0	1	Ag, As, Ba, Cd, Cr, Hg, Pb, Se	

Sampling Location	Depths Sampled (feet)	Number of Samples	Types of Analytes	Notes or Comments
PTX08-2036	2 5 10 20 31	1 1 1 1 1	HE, Met HE, N/N, Met 3HE, Met 3HE, N/N, Met 3HE, N/N, Met	
PTX08-2037	2 5 10 20 30	1 1 1 1 1	3HE, N/N, Met HE, N/N, Met HE, Met HE, N/N, Met HE, N/N, Met	
PTX08-2038	2 5 10 20 30	1 1 1 1 1	HE, N/N, Met HE, N/N, Met HE, N/N, Met HE, N/N, Met HE, Met	
PTX08-3880	1 2	1 2	3HE, N/N, Met, PCB, Pest Met	
PTX08-3881	1	1	3HE, N/N, Met, PCB, Pest	
ST-BG/02-0263	0	1	Cr-6	
PTX08-3881				listed with PTX08-3880
PTX08-3885	1	1	3HE, N/N, Met, PCB, Pest	
PTX08-3886	1	1	3HE, N/N, Met, PCB, Pest	
ST-BG/02-0264				
PTX08-3886				listed with PTX08-3885
PTX08-4175	1	2	HE, Met, PCB, Pest	
PTX08-4180	1	2	HE, N/N, Met, PCB, Pest	
PTX08-4181	0 1	1 1	As, Cr-6, Pb, Se As, Cr-6, Pb, Se	
PTX08-4182	0 1	1 1	As, Cr-6, Pb, Se As, Cr-6, Pb, Se	
PTX08-4183	0 1	1 1	As, Cr-6, Pb, Se As, Cr-6, Pb, Se	
PTX08-4185	1'	2	HE, Met, PCB, Pest	
PTX08-4189	0	1	As (only)	
PTX08-4190	1	2	HE, Met, PCB, Pest	
PTX08-4190				listed with PTX08-4189
PTX08-4191	0	1	As (only)	
PTX08-4192	0	1	As (only)	

Sampling Location	Depths Sampled (feet)	Number of Samples	Types of Analytes	Notes or Comments
PTX08-4193	0	1	As (only)	
PTX08-4194	0	1	As (only)	
PTX08-4195	1	2	HE, Met, PCB, Pest	
PTX08-4200	1	2	HE, Met, PCB, Pest	
PTX08-4205	1	2	HE, Met, PCB, Pest	
PTX08-4210	1	2	HE, Met, PCB, Pest	
PTX08-4215	1	2	HE, Met, PCB, Pest	
PTX08-4220	1	2	HE, (1)N/N, Met, PCB, Pest	
PTX08-4225	1	2	HE, N/N, Met, PCB, Pest	
ST-BG/00-0004				listed with PTX08-2035
ST-BG/00-0187	0	1	TATB, Ba, Perchlorates	
ST-BG/00-0188	0	1	TATB, Ba, Pest, Perchlorates	
ST-BG/00-0215	0	1	TATB, Ba, Perchlorates	
ST-BG/00-0216	0	1	TATB, Perchlorates	
ST-BG/02-0263				listed with PTX08-3880 & PTX08-3881
ST-BG/02-0264				listed with PTX08-3885 & PTX08-3886
ST-BG/02-0265				listed with PTX08-2033
ST-BG/02-0266				listed with PTX01-1002
ST-BG/02-0268	0	1	Ba, Sr, Tl	
ST-BG/02-0269	0	1	Ba, Sr, Tl	

HE = a suite of contaminants resulting from high explosives

3HE = DNT24, DNT26, and NO2BZ were the only high explosives analyzed

4HE = DNT24, DNT26, NO2BZ, and NT2 were the only high explosives analyzed

Met = a suite of metals, generally including Ag, As, Ba, Be, Ca, Cd, Co, Cr, Cr-6, Cu, F, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Sr, Tl, V, Zn.

N/N = Nitrates/nitrites

TATB = specific contaminant from high explosives

It was not clear whether or not the maps illustrating the extent of contaminants (Burning Ground RFIR) included the additional analyses.

Some of the maps of contaminants appeared to reflect the artifacts of few samples, rather than the actual nature and extent of contaminants.

DOE analyzed considerable soils and subsurface samples for Fluoride (F) and nitrates/nitrites (N/N) to consider that these contaminants would not be applicable to Pantex operations.

There were, at depths greater than 30 ft, a single sample collected from a single location. Given the notable (and not well-understood) variability of the samples from these contaminated sites, DOE did not determine the nature and extent of the contamination of SWMU 8.

**Table 4.** High Explosives at SWMU 8 (Playa 3)

Contaminant	Location	Depth (ft)	Concentration	Exceeds
2,4-Dinitrotoluene	PTX01-1002	3	0.25 mg/kg	RRS2
2,6-Dinitrotoluene	PTX01-1002	3	0.26 mg/kg	RRS2
3-Nitrotoluene	PTX01-1002	3	0.25 mg/kg	RRS1
4-Nitrotoluene	PTX08-4220	1	0.25 mg/kg	RRS1

**Table 5.** Metals at SWMU 8 (Playa 3)

Metal	# samples	# samples with detections (if fewer than all)	Range of Concentrations
Silver (Ag)	67	30	0.42 – 3.40
Arsenic (As)	78	71	0.61 – 15.00
Barium (Ba)	74		27 – 1700
Beryllium (Be)	66		0.11 – 1.40
Calcium (Ca)	13		2400 – 73,000
Cadmium (Cd)	67	15	0.3 – 1.2
Cobalt (Co)	66		2.4 – 26.0
Chromium (Cr)	67		2.2 – 30.0
Chromium-6 (Cr-6)	78	6	0.057 – 3.010
Copper (Cu)	66		2.2 – 25.0
Fluoride (F)	14	12	1.5 – 13.0
Iron (Fe)	13		4600 – 20,000
Mercury (Hg)	67	9	0.023 – 0.110
Potassium (K)	12		440 – 4900
Magnesium (Mg)	12		1000 – 4900
Manganese (Mn)	13		99 – 900
Sodium (Na)	12		54 – 300
Nickel (Ni)	66		3.1 – 25.0
Lead (Pb)	73		3.6 – 20.6
Antimony (Sb)	66	5	10 – 15
Selenium (Se)	73	25	0.22 – 2.60
Strontium (Sr)	58		18 – 310
Thallium (Tl)	69	22	2 – 79
Vanadium (V)	66		9.2 – 51.0
Zinc (Zn)	66		8.8 – 105.0



**Table 6.** Pesticides at SWMU 8 (Playa 3)

Contaminant	# samples	# samples detections	Range of Concentrations
<b>Pesticides (all)</b>	627	21	
Alpha Hexachlorocyclohexane	41	1	0.00049
Beta Hexachlorocyclohexane	42	4	0.00038 – 0.0068
Delta Hexachlorocyclohexane	41	4	0.0014 – 0.0020
DDD (4,4-DDD)	41	1	0.0023
Dieldrin	41	1	0.00054
Endosulfan Sulfate	8	8	0.0000048 – 0.0076
Heptachlor	41	2	0.00036 – 0.0012

**Table 7.** Radionuclides at SWMU 8 (Playa 3)

Radionuclide	# samples	range	units reported
Thorium-232	5	0.0873 – 0.327	pCi/g
Uranium-234	6	0.0256 – 1.3800	pCi/g
Uranium-238	6	0.0227 – 0.8200	pCi/g

**Table 8.** Semi-volatile Organic Contaminants at SWMU 8 (Playa 3)

Contaminant	total # analyses	# detections	range	depth
All SVOCs	3375	73		
bis(2-Ethylhexyl) Phthalate	67	16	0.02 – 1.80	149.8 ft
Benzo(g,h,i)Perylene	67	1	0.017	
Cyclohexanone	17	17	0.17 – 0.27	
Cyclohexene	3	3	30 – 38	
Decanal	1	1	0.0056	
Di-n-butyl Phthalate	67	21	0.013 – 0.280	
Di-n-octyl Phthalate	67	9	0.074 – 0.600	
Indeno(1,2,3-c,d) Pyrene	67	1	0.022	
Isophorone	4	4	0.033 – 0.060	

**Table 9.** Volatile Organic Contaminants at SWMU 8 (Playa 3)

Contaminant	total # analyses	# detections	range
All VOCs	2843	69	
Acetone	84	11	0.0085 – 0.23
Acrylonitrile	67	2	0.009 – 0.012
Toluene	82	4	0.00028 – 0.0021
Dichlorodifluoromethane	67	1	0.045
Methylene Chloride	86	28	0.0025 – 0.13
Nonanal	1	1	0.0056
Tetrahydrofuran	22	22	0.0094 – 0.023

**Table 10.** “Level 3 Data”

Contaminant	# samples	# samples with detections	range
Acetone	4	4	29 – 63
Toluene	4	3	1.3 – 48.0
Carbon disulfide	4	2	2.9 – 3.8
Chloroethane	4	1	2.2
cis-1,2-Dichloroethene	5	2	16 (2 values)
1,2-Dibromoethane	5	2	16 (2 values)
Freon-113	5	1	29
Methyl Ethyl Ketone (MEK)	5	2	8.8 – 12.0
Methyl Isobutyl Ketone (MIK)	5	2	1.8 – 2.7
Methylene Chloride	5	1	2.3
Trichloroethene	5	1	1.9

**Table 11.** Locations of “Level 3 Data” results

Well #	Contaminants	Depth	# samples w/contaminants	
OW-WR-46	Acetone, Toluene	459 ft	2	Ogallala well
OW-WR-47	Acetone, cis-1,2-Dichloroethene, 1,2-Dibromoethane, Freon-113	454 ft	4	Ogallala well
PTX01-1002	cis-1,2-Dichloroethene, 1,2-Dibromoethane	262 ft	2	Perched well (west of Playa 3)

Well #	Contaminants	Depth	# samples w/contaminants	
PTX01-1014	Acetone, Toluene, Carbon disulfide, Chloroethane, Methyl Ethyl Ketone (MEK), Methyl Isobutyl Ketone (MIK), Methylene Chloride, Trichloroethene (TCE)	237 ft	13	Unable to locate this well.  Could this be PTX01-1014A?

**page 9-6, section 9.3.3 Nature and Extent of Soil Gas Contamination**

Perhaps some of the information gathered from the Burning Grounds soil gas investigation would have been relevant to Playa 3; however, none of this information was provided.

**page 9-6, section 9.3.4 Nature and Extent of Surface Water and Sediment Contamination**

Outfall 030 is a ditch that channels stormwater from a portion of the Burning Ground; no stormwater flows were monitored from elsewhere.

No data were found for surface water from Playa 3, with the exception of the Summary Table 9.3-1.

DOE states that “Metals detected in Table 9.3-1 are indicative of naturally occurring compounds, suspended in the stormwater rather than dissolved from the source areas. This is supported by data from ditches discharging into Playas 1, 2, and 4, where only a small proportion of the compounds detected in stormwater samples are detected in the shallow soil within the WMGs contributing runoff.” However, the fact that HMX was present in all 10 analyses, of the single outfall ditch in which stormwater was monitored, suggests otherwise. DOE should justify the claim that Arsenic, Chromium, and other metals exceeding the Permit 02296 limits were, in fact, naturally occurring in those concentrations.

“No ditch sediment was identified or sampled...” should not be accepted as characterizing the sediment migration potential. DOE should have created sediment traps from which, following stormwater flows, with which it could have identified and sampled the sediments for contaminants.

Were all of the data in Table 9.3-2 taken from the ditch that flows into Playa 3 through Outfall 030, or elsewhere? The locations for these samples were not identified. Thus, it is not possible to evaluate DOE’s characterization of “Shallow Ditch Soil COPCs for SWMU 8.”

Although Table 9.3-2 describes the deepest detect for RRS 1 exceedance (1 foot), it does not provide information about the number of samples and at what depths samples were collected. Thus, it is not possible to evaluate DOE’s characterization of “Shallow Ditch Soil COPCs for SWMU 8.”

DOE’s claim that “The extent of sediment transport has been determined for downstream transport” has not been supported by data.

“Playa 3 has a wide vegetative barrier that remains uncultivated. This native buffer greatly reduces or eliminates sediment flow into the playa.” However, during droughts and when heavily grazed, the vegetation may be minimal. Also, the ditch from the Burning Ground can provide sediment flow into the playa, and areas adjacent to the playa are cultivated.

#### **page 9-7, section 9.4 Migration Pathways**

The migration pathways illustrated in Figure 5.4-5 for Playa 3 fall short of describing the summarization of the data. For examples, (1) Outfall 030 identifies only the contaminant pathway from a portion of the Burning Ground; (2) no pathway was listed (even as historical) from the Burning Ground; (3) the subsurface was characterized primarily from a single location at depth – PTX01-1002 – and extrapolated, without an adequate experimental design to validate, to the entire area; (3) only an “uncertain” pathway was identified for the perched aquifer, although DOE’s Figure 3-12 et al illustrate the presence of the perched aquifer (restricted to Playa 3, and that area in which they have well data); (4) the fact that a perched aquifer at Playa 3 exists indicates that contaminants also had the same opportunities for that pathway; (5) the fact that the perched aquifer at Playa 3 appears to be shallow suggests that there may indeed have been a more direct or preferential pathway to the Ogallala Aquifer itself in this area; and (6) information from the Ogallala wells (including PTX06-1057A) should have been used to evaluate this pathway in a genuine attempt to define the nature and extent of contamination, and the migration pathways.

#### **page 9-7 and 9-8, section 9.4.1 Soil Pathways**

Soils in this document appear to include the subsurface, which are not soils.

DOE failed to identify the potential preferential pathway of an old homestead well at Playa 3, near the Burning Ground, that (to my knowledge) has not been located and plugged.

The mechanisms failed to identify (as bullets) in this section

- Contribution to Ogallala Aquifer through natural or preferential pathways, such as leakage from the perched aquifer;
- Economic impacts to grazing in the playa and to farming and grazing to lands adjacent to Playa 3 and the Burning Ground;
- Human health impacts due to crops and meat, grown at this site, that go to market without monitoring.

“Figure 5.4-5 indicates that the soil pathway does not extend vertically into deeper transmissive zones or into the perched aquifer.” DOE’s sampling and analyses were inadequate to document this statement. For example, subsurface samples at depths were from a single location (PTX01-1002).

“Practices to eliminate releases have continually improved, making a recent release unlikely.” DOE’s data provided from Outfall 030 disputes this statement.

“Based on this, ... vertical migration rate of the COPCs in SWMU 8 is very low.” The presence of bis-2ethylhexyl phthalate at a depth of 149.8 ft, which exceeded RRS2 AL (1.8 mg/kg at PTX01-1001[*Burning Ground RFIR, Figure 5.2-17 Attachment*]) seems to dispute this statement.

**page 9-8, section 9.4.2 Surface Water and Sediment Pathway**

No real “tracking” of soil COPCs through the surface water flow pathway was done, based upon the data presented in this document.

**page 9-8, section 9.4.2.1 Surface Water Runoff and Infiltration**

Regarding factors that reportedly “limit infiltration in the inter-playa areas” and “SWMU 8”,

- high intensity rainfall events in the Texas Panyhandle do, indeed, tend to carry sediments with them – especially following periods of drought, which oftentimes results in overgrazing results.
- DOE failed to provide any basis for concluding the Blackwater Draw Formation has a very low permeability.
- DOE failed to discuss the large dessication cracks that result in Playa 3 during periods of drought – dessication cracks which may require 2-3 precipitation events with which to wet up the heavy clays and seal over these preferential infiltration pathways to the subsurface.
- DOE failed to identify and sample any other rivulets or ditches that flow into Playa 3.

**page 9-9, section 9.4.2.2 Drainage Pattern**

One could argue that the HMX through Outfall 030 fits the description of a direct industrial discharge originating from within the Playa 3 drainage basin area.

**page 9-9, section 9.4.2.3 Areas Contributing to Surface Drainage**

DOE did not appear to have identified sampling locations within the “system of unnamed, site drainage ditches” that flow finally into the playa. DOE should do so, to support its conclusions reported in this section.

**page 9-9, section 9.4.2.4 Surface Water and Sediment Accumulation Areas**

This section presents conflicting information.

Sediment accumulation areas were not identified, although DOE had the ability to establish sediment traps with which to do so, or with which to conclude that sediment transport is not taking place.

“Regular ditch maintenance practices limit sediment accumulation. The well-vegetated sides and bottoms of the ditches further limit sediment transport...” These two statements are conflicting. Ditch maintenance, generally, requires removing vegetation and sediment so that surface water flow is not impeded. Also, the high-intensity events often experienced in this region that follow periods of drought would not be conducive to well vegetated areas – this is how arroyos form. Thus, a regularly maintained ditch would not fit the description of a well-vegetated one.

DOE reports that this sampling is reported in the Ditches and Playas RFIR – again, a failure to provide a stand-alone document.

“Surface water samples have been collected periodically since 1992 from within the playas and from stormwater, permitted internal, and permitted final outfalls I ditches leading to the playas.

These outfalls are shown on Figure 9.0-1.” Unfortunately, Figure 9.0-1 shows no outfalls whatsoever. Thus, no outfalls were sampled, or the Figure is deficient.

**(page 9-10, paragraph 2)**

“In evaluating data from outfalls other than Outfall 001, where new data are no longer being collected, the 1999 RRS 2 GW-Ind is used as the decision level basis if action levels are not specified in permits. COPCs that are above the decision level are treated as RRS 1 AL exceedances in this RFIR.” This should not be accepted.

**page 9-10, section 9.4.2.5 Source Area Soil COPCs**

[From the 1992 Ditches and Playas Assessment ADS 1216 (AL-PX-08)], to be investigated at Playa 3 include Acetone, Barium, HE, Mercury, Silver, Tetrahydrofuran, Toluene, VOCs, Radionuclides.

[From the 1996 Ditches and Playas Assessment ADS 1216 (AI-PX-08)] – Phase II fieldwork revealed that while strontium, HMX, dichlorodifluoromethane, barium and thallium exceeded the decision criteria, only barium and thallium exceeded the cleanup criteria.

This RFIR identifies only contaminants in shallow soil to include metals (Ba, Cd, Cr-6, Cu, Sr, Tl), pesticides (BHCβETA), SVOCs (bis-2-ethylhexyl phthalate), and VOCs (FC12 and Methylene Chloride).

**page 9-10, section 9.4.2.6 Analysis of Transport and Accumulation Areas**

As stated above, DOE failed to collect sediment samples, and thus was not able to analyze the transport of sediments or contaminants associated with them.

**page 9-10, section 9.4.2.7 Tracking COPCs**

(1<sup>st</sup> paragraph) “The investigation of contaminant transport ... by determining if the contaminants detected above RRS 1 ALs in SWMU 8 surface soils and surface water...” This statement is misleading, in that DOE has stated (noted above) that RRS 1 ALs in surface water will, in fact, be RRS 2 GW-Ind levels. DOE should consistently report accurately this information throughout the RFIR.

Outfall 030 is an intermediate sampling location between only part of the Burning Grounds and Playa 3. Other areas of the Burning Grounds drain into the playa through different routes.

Table 9.4-1 erroneously suggests a flow pattern that is not accurate. Also, the few samples collected by DOE would not be able to make a connection between SWMU 11 and the Burning Grounds with Playa 3 sediments and surface water. A well-designed experimental design could have accomplished that, however.

“Table 9.4-1 demonstrates ... compounds detected above RRS 1 ... in Playa 3 surface soil or surface water” is, as stated above, those compounds exceeding RRS 2 GW-Ind in surface water.

“Surface soil COPCs identified in SWMU 11 have been identified in Playa 3 sediments.” However, DOE conducted no sampling in the southern part of Playa 3 (an area sometimes referred to by Pantex representatives as the “playette” but that is, in fact, part of Playa 3).

DOE appears to be dismissing pesticides that exceed RRS 1 to agricultural contaminants. To do so, DOE must provide the information that these pesticides (1) were used in this area and in quantities consistent with typical farming practices by farmers during the relevant time frames, and (2) had not been disposed of by DOE at the Burning Ground or used at the SWMUs in the drainage basin.

#### **page 9-12, section 9.4.3 Groundwater Pathway**

The wells DOE relied upon to draw its conclusions were not identified.

DOE disregards the role that the dessication cracks in Playa 3 play in infiltration of water following precipitation events.

DOE states that “Groundwater COPCs have not been detected in the Ogallala Aquifer.” However, data from PTX06-1057A (attached).

#### **page 9-12, section 9.4.4 Air Pathway**

No attempt to evaluate or quantify the air pathway by conducting air monitoring was reported. This approach disregards those time periods when vegetation is stressed due to heat, drought, and grazing pressures – when the vegetative cover would provide little restraint to blowing dust and contaminants.

#### **page 9-12, section 9.5 Evaluation of Closure**

DOE reports that “Data collected since the Burning Grounds Final RCRA Facility Investigation Report support the conclusions and closures presented in the BG RFIR.” However, no additional data were located for this review. DOE should identify clearly where those data can be found.

#### **page 9-12, section 9.6 Groundwater Investigation**

As stated earlier, the shallow perched aquifer beneath Playa 3 suggests that infiltration has and is occurring, and that a pathway to the Ogallala Aquifer may be operating.

#### **page 9-13, section 9.7 SWMU 8 Summary**

Because adequate sampling and analyses that would justify closure to RRS1 or RRS2 were either not done, or not provided in this document, closure should only be considered to RRS3. This site should be included in the Baseline Risk Assessment process.

## **SWMU 63 (Landfill 12)**

SWMU 53 (Landfill 12) is located within the area of SVS 7; thus, it would seem difficult to distinguish between subsurface, surface water, and groundwater contamination that results from either site.

### **page 12-2, Section 12.1.2 Previous Site Investigations**

“In 1994, Jacobs conducted a geophysical survey of the landfill followed by a soil gas investigation.”

No results of the soil gas investigation were presented and (page 12-4, Section 12.2.2) “a soil gas study was not conducted in SWMU 63.”

(paragraph 2) “A recommendation ... relocate the existing drainage ditch.”

DOE did not state whether or not the drainage ditch was, indeed, relocated.

### **page 12-2, Section 12.2 Summary of COPCs**

DOE did not provide tables that illustrated their efforts to sample the landfills at various depths. This information would have enabled reviewers to put the exceedances into a context of those deemed not to be exceedances.

DOE collected few samples at depth – for example, one sample at 10 ft, one sample at 20 ft bgs.

DOE did not report all results that exceeded RRS1 and RRS2 ALs – especially for Barium and Strontium, for samples collected at 0-2 ft bgs, (discussed earlier). Thus, Table 12.3-1 (page 12-7) does not provide an accurate summary.

Some of DOE’s detection limits exceeded RRS1 ALs, which should be unacceptable.

### **page 12-4, Section 12.2.3 Surface Water and Sediment COPCs**

Surface water RRS1 ALs were, as reported elsewhere in this document, RRS2 GW-Ind. DOE should not be allowed to use this standard.

### **pages 12-6, Section 12.3.1 Nature and Extent of Soil Contamination**

(paragraph 2) “Nature and extent figures are based on the data after the sample locations representing soil removed through ICMs are removed from the data set. Confirmation sample results are included...”

This statement contradicts (page 12-10, Section 12.3.4 ICM) “No ICMs were conducted as part of this investigation.”

DOE should clarify the seemingly contradiction. This type of error, throughout the document, provides a reviewer with little confidence that the information is reliable.



DOE's detection limits exceeded RRS1 ALs for many samples. DOE should be required to meet minimum standards for its data.

**page 12-11, Table 12.3-6**

DOE provides a table for "ditch" samples that exceed RRS1 ALs, but no similar table to summarize other soil and subsurface samples. DOE should provide accurate and complete tables that summarize fully its results.

**page 12-13, Section 12.4.1 Soil Pathway**

DOE did not explain the contaminants in the samples from Outfall 005.

**page 12-13, Section 12.4.2.1 Surface Water Runoff and Infiltration**

DOE disregarded the effects of dessication cracks in Playa 2 – which oftentimes require several precipitation events to seal over. These cracks play large roles in infiltration at playas in this region.

**page 12-15, Section 12.4.2.7 Tracking COPCs**

DOE states that it "tracked" exceedances from source to the terminal point. This was not the case. DOE attempted to compare contaminants it detected at SWMU 63 with detections at Outfall 005 and Playa 2 (not the same as "tracking").

**page 12-17, Section 12.4.3 Groundwater Pathway**

DOE states that the "perched aquifer is not used as a drinking water source at Pantex." Although this may be true on-site, DOE's neighbor to the north does use the perched aquifer for domestic water. It is unclear why DOE included this statement – what was the point it tried to make?

DOE provided no lists of wells that it used to evaluate groundwater. DOE should be required to do so.

**page 12-17, Section 12.4.4 Air Pathway**

DOE conducted no air sampling at this site.

**page 12-17, Section 12.5.1 Soil Closure**

DOE states "Surface soil RRS2 closure is protective of air and groundwater, and subsurface soil RRS2 closure is protective of groundwater."

Because groundwater at Pantex is contaminated, exceeding health standards, it would seem that soil and the subsurface at the site have not been protective of groundwater. This statement, thus, is not substantiated by groundwater data.

**page 12-19, Section 12.5.1.2 SPLP Hot Spot Sampling and Analysis**

DOE's approach to "twinning" or finding again "hot spots" is not scientifically possible or defensible. DOE's claims that it can find again these hot spots, with so little sampling and analyses to begin with, seem to assume that (1) they adequately identified a contaminant hot spot in the first place, and it was an isolated occurrence; and (2) contaminants stay in place. DOE should be required to justify, on a scientific basis, its manipulation of the data in this way.

This comment applies to other occurrences of DOE's "twinning" (12.5.1.9 SVOCs et al).

**page 12-22, Section 12.5.3 Surface Water and Sediment Closure**

DOE used RRS2 GW-Ind for its RRS1 ALs for surface water. What, then, did DOE use for its RRS2 ALs? DOE did not provide this information.

**page 12-22, Section 12.5.4 Closure Summary**

The nature and extent of this site were not characterized. Because of the errors in DOE's data evaluation, it is difficult to have confidence in DOE's conclusions.

DOE should re-evaluate its data, correct its errors in its database regarding RRS1 and RRS2 ALs, and reconstruct its conclusions, figures, and its tables that portray those conclusions.

DOE should re-examine and correct its **Figures 12.3-3 and Attachment** (and **Figures 12.5-1, 12.5-2, and 12.5-6**) so that figures and tables reflect accurately any exceedances of RRS1 and RRS2 ALs. These errors seem to be most numerous in the Barium and Strontium analytical results, but also occur in other metals, such as Copper and Mercury.

More importantly, DOE's inclusion of such fundamental errors in this RFIR raises questions about all of the analytical evaluations and conclusions presented.

### **SWMU 64 (Landfill 13) and SWMU 66 (Landfill 15)**

Generally, the same comments made above for SWMU 63 (Landfill 12) apply to these two landfills.

DOE's approaches to investigating and reporting information are similar; thus, the errors of its data evaluation (for example, incorrect RRS1 and RRS2 ALs) and the effects of those errors apply in the same way to these two sites.

## APPENDIX A

Extracted DOE data provided in the *Final RCRA Facility Investigation Report, Independent Sites at USDOE Pantex Plant* (January 2004)

for which inaccurate RRS1 or RRS2 Action Levels were assigned.

**NOTE:** Only values that were identified in this review as having exceeded the correct RRS1 or RRS2 Action Level were included in this appendix.

DOE did not appear to have reported any of these exceedances on its Figures or Attachments displaying its Extent of Metals Contamination.

Barium

RRS1 = 190 mg/kg

RRS2 = 200 mg/kg

swmu	loc_code	PUD	top_de	irpim	measu	value	uorresult	ND>RRS1	RRS1	AL	RRS1	RRS2	AL	RRS2	SAI	Excd	detection	lab	c	revi
106	ST-S106-0002	B	0	BA	198	MG/KG	N	190	1000	N		1000	N	N			0.58	N*		
106	ST-S106-0005	B	0	BA	218	MG/KG	N		1000	N	200	1000	N	N			0.51	N*		
106	ST-S106-0001	B	0	BA	243	MG/KG	N		1000	N		1000	N	N			0.58	N*		
106	ST-S106-0004	B	0	BA	247	MG/KG	N		1000	N		1000	N	N			0.58	N*		
106	ST-S106-0004	B	0	BA	264	MG/KG	N		1000	N		1000	N	N			0.57	N*		
11	ST-SWMU11-0004	U	0	BA	265	MG/KG	N		190	Y		200	Y	N			23	N*E		
FS11	ST-FS11-0002	U	0	BA	219	MG/KG	N		190	Y		200	Y	N			27.7		J	
FS11	ST-FS11-0007	U	0	BA	262	MG/KG	N		190	Y		200	Y	N			25.5	NE	J	
FS11	ST-FS11-0006	U	0	BA	276	MG/KG	N		190	Y		200	Y	N			22.7	NE	J	
LF12	PTX13-2723	B	2	BA	221	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2723	B	2	BA	221	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2723	B	2	BA	222	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2723	B	2	BA	222	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2723	B	2	BA	222	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2723	B	2	BA	222	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2725	B	0	BA	249	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2725	B	0	BA	249	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2724	B	0	BA	274	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2724	B	0	BA	274	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2725	B	2	BA	298	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2725	B	2	BA	298	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX07-2J01	B	2	BA	304	MG/KG	> N		1000	N		1000	N	N			2.4			
LF12	PTX07-2J01	B	2	BA	304	MG/KG	> N		1000	N		1000	N	N			2.4			
LF12	PTX13-2723	B	0	BA	332	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2723	B	0	BA	332	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2724	B	2	BA	353	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2724	B	2	BA	353	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2721	B	0	BA	406	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2721	B	0	BA	406	MG/KG	> N		1000	N		1000	N	N			1.6			
LF12	PTX13-2722	B	0	BA	433	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	PTX13-2722	B	0	BA	433	MG/KG	> N		1000	N		1000	N	N			1.5			
LF12	ST-LF12-0004	U	0	BA	191	MG/KG	N	190	1000	N		1000	N	N			23.1			
LF12	ST-LF12-0004	U	0	BA	191	MG/KG	N		1000	N		1000	N	N			23.1			
LF12	PTX07-2J18	U	0	BA	198	MG/KG	N		1000	N		1000	N	N			0.14			
LF12	PTX07-2J18	U	0	BA	198	MG/KG	N		1000	N		1000	N	N			0.14			
LF12	ST-SVS7E-0028	U	0	BA	247	MG/KG	N		1000	N	200	1000	N	N			23.3			

Ba - 1

LF12	ST-SVS7E-0028	U	0	BA	247 MG/KG	N	1000 N	200	1000 N	N	23.3
LF12	ST-LF12-0005	U	0	BA	306 MG/KG	N	1000 N		1000 N	N	23.7
LF12	ST-LF12-0005	U	0	BA	306 MG/KG	N	1000 N		1000 N	N	23.7
LF12	ST-SVS7E-0035	U	0	BA	318 MG/KG	N	1000 N		1000 N	N	23.3
LF12	ST-SVS7E-0035	U	0	BA	318 MG/KG	N	1000 N		1000 N	N	23.3
LF12	ST-SVS7E-0025	U	0	BA	401 MG/KG	N	1000 N		1000 N	N	23.5
LF12	ST-SVS7E-0025	U	0	BA	401 MG/KG	N	1000 N		1000 N	N	23.5
LF12	ST-SVS7E-0020	U	0	BA	475 MG/KG	N	1000 N		1000 N	N	23.7
LF12	ST-SVS7E-0020	U	0	BA	475 MG/KG	N	1000 N		1000 N	N	23.7
LF12	ST-SVS7E-0019	U	0	BA	510 MG/KG	N	1000 N		1000 N	N	21.3
LF12	ST-SVS7E-0019	U	0	BA	510 MG/KG	N	1000 N		1000 N	N	21.3
LF12	ST-SVS7E-0036	U	0	BA	547 MG/KG	N	1000 N		1000 N	N	23.6
LF12	ST-SVS7E-0036	U	0	BA	547 MG/KG	N	1000 N		1000 N	N	23.6
LF12	ST-SVS7E-0031	U	0	BA	748 MG/KG	N	1000 N		1000 N	N	22.6
LF12	ST-SVS7E-0031	U	0	BA	748 MG/KG	N	1000 N		1000 N	N	22.6
LF13	PTX09-3013	B	0	BA	193 MG/KG	N	1000 N		1000 N	N	1.13
LF13	PTX09-2052	B	0	BA	194 MG/KG	N	1000 N		1000 N	N	1.51
LF13	PTX09-2068	B	0	BA	196 MG/KG	N	1000 N		1000 N	N	1.09 J
LF13	PTX09-2074	B	0	BA	198 MG/KG	N	1000 N		1000 N	N	1.07
LF13	PTX09-3014	B	0	BA	198 MG/KG	N	1000 N		1000 N	N	1.39
LF13	PTX07-2K08	B	0	BA	200 MG/KG	N	1000 N	200	1000 N	N	45
LF13	ST-LF/13-0015	B	0	BA	202 mg/kg	N	1000 N		1000 N	N	5
LF13	PTX09-2073	B	0	BA	208 MG/KG	N	1000 N		1000 N	N	1.04 J
LF13	PTX09-3015	B	0	BA	209 MG/KG	N	1000 N		1000 N	N	1.33
LF13	PTX09-2054	B	0	BA	215 MG/KG	N	1000 N		1000 N	N	1.09 J
LF13	ST-LF/13-0009	B	0	BA	229 mg/kg	N	1000 N		1000 N	N	1
LF13	ST-LF/13-0014	B	0	BA	230 mg/kg	N	1000 N		1000 N	N	5
LF13	ST-LF/13-0010	B	0	BA	232 mg/kg	N	1000 N		1000 N	N	2
LF13	PTX09-2056	B	0	BA	233 MG/KG	N	1000 N		1000 N	N	1.1 J
LF13	PTX09-2054	B	0	BA	235 MG/KG	N	1000 N		1000 N	N	1.1 J
LF13	PTX09-2060	B	0	BA	243 MG/KG	N	1000 N		1000 N	N	1.08 J
LF13	PTX09-2057	B	0	BA	256 MG/KG	N	1000 N		1000 N	N	1.09 J
LF13	PTX09-2061	B	0	BA	265 MG/KG	N	1000 N		1000 N	N	1.09 J
LF13	ST-LF/13-0016	B	0	BA	266 mg/kg	N	1000 N		1000 N	N	1
LF13	PTX09-2061	B	0	BA	272 MG/KG	N	1000 N		1000 N	N	1.09 J
LF13	ST-LF/13-0011	B	0	BA	284 mg/kg	N	1000 N		1000 N	N	5
LF13	PTX09-2058	B	0	BA	300 MG/KG	N	1000 N		1000 N	N	1.1 J

LF13	PTX09-2055	B	0 BA	301 MG/KG	N	1000 N	200	1000 N	N	1.09 J
LF13	PTX09-2194	B	0 BA	329 MG/KG	N	1000 N	↓	1000 N	N	45 J
LF13	PTX07-2K02	B	1 BA	262 MG/KG	> N	1000 N	↓	1000 N	N	2 N*
LF13	PTX09-2063	U	0 BA	198 MG/KG	N	190	1000 N	1000 N	N	1.12 J
LF15	PTX07-4M02	B	2 BA	275 MG/KG	> N	1000 N	200	1000 N	N	2.2
LF15	PTX07-4M02	U	0 BA	202 MG/KG	> N	1000 N	↓	1000 N	N	2.4
LF15	ST-LF15-0011	U	0 BA	204 MG/KG	N	1000 N	↓	1000 N	N	24 *
LF15	PTX07-2M26	U	0 BA	207 MG/KG	N	1000 N	↓	1000 N	N	0.14 N
LF15	PTX07-2M02	U	0 BA	209 MG/KG	N	1000 N	↓	1000 N	N	0.24
LF15	PTX07-2M09	U	0 BA	221 MG/KG	N	1000 N	↓	1000 N	N	0.24
LF15	PTX07-2M01	U	0 BA	223 MG/KG	N	1000 N	↓	1000 N	N	0.24
LF15	PTX07-4M01	U	0 BA	224 MG/KG	> N	1000 N	↓	1000 N	N	2.3
LF15	PTX07-2M08	U	0 BA	241 MG/KG	N	1000 N	↓	1000 N	N	0.23
LF15	PTX07-2M13	U	0 BA	253 MG/KG	N	1000 N	↓	1000 N	N	0.13 N
LF15	PTX07-2M28	U	0 BA	258 MG/KG	N	1000 N	↓	1000 N	N	0.14 N
LF15	PTX07-2M27	U	0 BA	271 MG/KG	N	1000 N	↓	1000 N	N	0.14 N
LF15	ST-LF15-0008	U	0 BA	292 MG/KG	N	1000 N	↓	1000 N	N	22.5
LF15	PTX07-2M19	U	0 BA	306 MG/KG	N	1000 N	↓	1000 N	N	0.15
LF15	ST-LF15-0009	U	0 BA	399 MG/KG	N	1000 N	↓	1000 N	N	22.2
LF15	PTX07-3M01	U	1 BA	317 MG/KG	> N	1000 N	↓	1000 N	N	2.6
svs6	PTX13-2604	B	0 BA	240 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2617	B	0 BA	273 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2606	B	0 BA	293 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2623	B	0 BA	305 MG/KG	> N	1000 N	↓	1000 N	N	1.1
svs6	PTX13-2618	B	0 BA	310 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2603	B	0 BA	352 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2605	B	0 BA	394 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2603	B	0 BA	409 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2610	U	0 BA	239 MG/KG	N	1000 N	↓	1000 N	N	1.3 J
svs6	PTX13-2619	U	0 BA	249 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2619	U	0 BA	249 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2620	U	0 BA	258 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2602	U	0 BA	283 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2609	U	0 BA	310 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2601	U	0 BA	354 MG/KG	N	1000 N	↓	1000 N	N	1.1 J
svs6	PTX13-2624	U	0 BA	369 MG/KG	> N	1000 N	↓	1000 N	N	1.1
svs6	PTX13-2624	U	0 BA	380 MG/KG	> N	1000 N	↓	1000 N	N	1.1

Ba-3

SVS6 ST-SVS6-0002	U	0 BA	403 MG/KG	N		1000 N	200	1000 N	N	23.4
SVS7A PTX13-2702	B	0 BA	191 MG/KG	> N	190	1000 N		1000 N	N	1.7
SVS7A PTX13-2710	B	2 BA	191 MG/KG	> N	↓	1000 N		1000 N	N	1.8
SVS7A PTX13-2708	B	2 BA	199 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2703	B	2 BA	223 MG/KG	> N		1000 N	200	1000 N	N	1.8
SVS7A PTX13-2709	B	2 BA	225 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2705	B	0 BA	233 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2706	B	2 BA	233 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2707	B	0 BA	234 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2704	B	0 BA	235 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2701	B	0 BA	239 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2704	B	2 BA	255 MG/KG	> N		1000 N		1000 N	N	1.9
SVS7A PTX13-2703	B	2 BA	256 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2708	B	2 BA	274 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2706	B	0 BA	278 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2702	B	2 BA	317 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2710	B	0 BA	337 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2703	B	0 BA	402 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A ST-SVS7G-0010	B	0 BA	402 MG/KG	N		1000 N		1000 N	N	20.9
SVS7A PTX13-2701	B	2 BA	470 MG/KG	> N		1000 N		1000 N	N	1.8
SVS7A PTX13-2708	B	0 BA	537 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2709	B	0 BA	625 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A PTX13-2709	B	0 BA	625 MG/KG	> N		1000 N		1000 N	N	1.7
SVS7A ST-SVS7G-0007	U	0 BA	192 MG/KG	N	190	1000 N		1000 N	N	21.3
SVS7A ST-SVS7D-0015	U	0 BA	196 MG/KG	N	↓	1000 N		1000 N	N	24
SVS7A ST-SVS7D-0018	U	0 BA	207 MG/KG	N		1000 N	200	1000 N	N	23.7
SVS7A ST-SVS7D-0003	U	0 BA	212 MG/KG	N		1000 N		1000 N	N	23.5
SVS7A ST-SVS7G-0015	U	0 BA	218 MG/KG	N		1000 N		1000 N	N	22.4 N*
SVS7A ST-SVS7D-0004	U	0 BA	220 MG/KG	N		1000 N		1000 N	N	23.7 N*
SVS7A ST-SVS7D-0022	U	0 BA	221 MG/KG	N		1000 N		1000 N	N	22.6
SVS7A ST-SVS7G-0005	U	0 BA	223 MG/KG	N		1000 N		1000 N	N	23.3
SVS7A ST-SVS7G-0018	U	0 BA	223 MG/KG	N		1000 N		1000 N	N	20.6 N*
SVS7A ST-SVS7G-0011	U	0 BA	265 MG/KG	N		1000 N		1000 N	N	22.6 N*
SVS7A ST-SVS7G-0012	U	0 BA	274 MG/KG	N		1000 N		1000 N	N	21.2 N*
SVS7A ST-SVS7G-0014	U	0 BA	336 MG/KG	N		1000 N		1000 N	N	21.2 N*
SVS7A ST-SVS7D-0017	U	0 BA	357 MG/KG	N		1000 N		1000 N	N	21.3
SVS7A ST-SVS7G-0017	U	0 BA	525 MG/KG	N		1000 N		1000 N	N	23.1 N*

Ba-4



SVS7B PTX13-2728	B	2 BA	194 MG/KG	N	190	1000 N	1000 N	N	1.8 J
SVS7B ST-SVS7B-0005	B	0 BA	199 MG/KG	N	↓	1000 N	1000 N	N	24.2 N
SVS7B PTX13-2734	B	2 BA	200 MG/KG	N		1000 N	200	1000 N	1.8 J
SVS7B PTX13-2716	B	0 BA	209 MG/KG	> N		1000 N	1000 N	N	1.7
SVS7B PTX13-2731	B	0 BA	212 MG/KG	N		1000 N	1000 N	N	1.7 J
SVS7B PTX13-2718	B	0 BA	213 MG/KG	> N		1000 N	1000 N	N	1.7
SVS7B PTX13-2728	B	0 BA	216 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2719	B	2 BA	230 MG/KG	> N		1000 N	1000 N	N	1.7
SVS7B PTX13-2735	B	2 BA	233 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2726	B	0 BA	234 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2731	B	2 BA	239 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2735	B	0 BA	240 MG/KG	N		1000 N	1000 N	N	1.7 J
SVS7B PTX13-2717	B	0 BA	259 MG/KG	> N		1000 N	1000 N	N	1.7
SVS7B PTX13-2734	B	0 BA	265 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2713	B	0 BA	266 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2732	B	0 BA	267 MG/KG	N		1000 N	1000 N	N	1.7 J
SVS7B PTX13-2729	B	0 BA	284 MG/KG	N		1000 N	1000 N	N	1.7 J
SVS7B PTX13-2715	B	0 BA	304 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2727	B	0 BA	310 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2730	B	0 BA	333 MG/KG	N		1000 N	1000 N	N	1.7 J
SVS7B PTX13-2714	B	0 BA	350 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2711	B	2 BA	374 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2713	B	2 BA	382 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2714	B	2 BA	400 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2714	B	2 BA	400 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2712	B	0 BA	408 MG/KG	> N		1000 N	1000 N	N	2
SVS7B PTX13-2715	B	2 BA	416 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2711	B	0 BA	442 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2713	B	2 BA	490 MG/KG	> N		1000 N	1000 N	N	1.8
SVS7B PTX13-2729	B	2 BA	609 MG/KG	N		1000 N	1000 N	N	1.8 J
SVS7B PTX13-2717	B	2 BA	948 MG/KG	> N		1000 N	↓	1000 N	1.8
SVS7B ST-SVS7C-0004	U	0 BA	192 MG/KG	N	190	1000 N	1000 N	N	23.2
SVS7B ST-SVS7C-0038	U	0 BA	195 MG/KG	N	↓	1000 N	1000 N	N	26
SVS7B ST-SVS7F-0004	U	0 BA	201 MG/KG	N		1000 N	200	1000 N	22.2 N
SVS7B ST-SVS7F-0018	U	0 BA	201 MG/KG	N		1000 N	↓	1000 N	24.3
SVS7B ST-SVS7A-0015	U	0 BA	204 MG/KG	N		1000 N	↓	1000 N	26.9
SVS7B ST-SVS7B-0023	U	0 BA	226 MG/KG	N		1000 N	↓	1000 N	113

Ba-5

SVS7B ST-SVS7F-0015	U	0	BA	238 MG/KG	N	1000 N	200	1000 N	N	24.7
SVS7B ST-SVS7B-0024	U	0	BA	247 MG/KG	N	1000 N		1000 N	N	25.1 N*
SVS7B ST-SVS7F-0016	U	0	BA	259 MG/KG	N	1000 N		1000 N	N	47.9
SVS7B ST-SVS7B-0027	U	0	BA	268 MG/KG	N	1000 N		1000 N	N	24.5 N*
SVS7B ST-SVS7B-0028	U	0	BA	294 MG/KG	N	1000 N		1000 N	N	25.1
SVS7B ST-SVS7A-0003	U	0	BA	303 MG/KG	N	1000 N		1000 N	N	24.3
SVS7B ST-SVS7F-0001	U	0	BA	313 MG/KG	N	1000 N		1000 N	N	21.2 N
SVS7B ST-SVS7F-0017	U	0	BA	348 MG/KG	N	1000 N		1000 N	N	23.9
SVS7B ST-SVS7B-0025	U	0	BA	392 MG/KG	N	1000 N		1000 N	N	23.7 N*
SVS7B ST-SVS7A-0003	U	0	BA	556 MG/KG	N	1000 N		1000 N	N	24
SVS7B ST-SVS7C-0037	U	0	BA	849 MG/KG	N	1000 N	↓	1000 N	N	27.9

Ba-6

# Strontium

$$RRS1 = RRS2 = 44 \text{ mg/kg}$$

swmu	loc_code	PUD	top	irpims	measured value	ur result	ND>RRS1	RRS1 AL	RRS1	RRS2 AL	RRS2	SAI	Excd	detection	lab rev
106	ST-S106-0004	B	0	SR	117 MG/KG	N	44	690 N	44	690 N	N			0.29	
106	ST-S106-0004	B	0	SR	123 MG/KG	N		690 N		690 N	N			0.29	
106	ST-S106-0001	B	0	SR	125 MG/KG	N		690 N		690 N	N			0.29	
106	ST-S106-0002	B	0	SR	128 MG/KG	N		690 N		690 N	N			0.29	
106	ST-S106-0003	B	0	SR	148 MG/KG	N		690 N		690 N	N			0.29	
FS11	ST-FS11-0007	U	0	SR	47.1 MG/KG	N		44 Y		44 Y	N			6.4 E	
FS11	ST-FS11-0002	U	0	SR	48.7 MG/KG	N		44 Y		44 Y	N			6.9	
FS11	ST-FS11-0006	U	0	SR	77.3 MG/KG	N		44 Y		44 Y	N			5.7 E	
LF12	PTX13-2722	B	2	SR	44.5 MG/KG >	N	44	690 N	44	690 N	N			11.1	
LF12	PTX13-2722	B	2	SR	44.5 MG/KG >	N		690 N		690 N	N			11.1	
LF12	PTX13-2722	B	2	SR	44.5 MG/KG >	N		690 N		690 N	N			11.1	
LF12	PTX13-2722	B	2	SR	44.5 MG/KG >	N		690 N		690 N	N			11.1	
LF12	ST-SVS7E-0016	U	0	SR	46.4 MG/KG	N		690 N		690 N	N			5.4	
LF12	ST-SVS7E-0016	U	0	SR	46.4 MG/KG	N		690 N		690 N	N			5.4	
LF12	ST-SVS7E-0030	U	0	SR	47.9 MG/KG	N		690 N		690 N	N			5.9	
LF12	ST-SVS7E-0030	U	0	SR	47.9 MG/KG	N		690 N		690 N	N			5.9	
LF12	PTX13-2721	B	2	SR	48.5 MG/KG >	N		690 N		690 N	N			11	
LF12	PTX13-2721	B	2	SR	48.5 MG/KG >	N		690 N		690 N	N			11	
LF12	PTX13-2721	B	2	SR	48.5 MG/KG >	N		690 N		690 N	N			11	
LF12	PTX13-2721	B	2	SR	48.5 MG/KG >	N		690 N		690 N	N			11	
LF12	ST-SVS7E-0028	U	0	SR	53 MG/KG	N		690 N		690 N	N			5.8	
LF12	ST-SVS7E-0028	U	0	SR	53 MG/KG	N		690 N		690 N	N			5.8	
LF12	ST-SVS7E-0020	U	0	SR	57.7 MG/KG	N		690 N		690 N	N			5.9	
LF12	ST-SVS7E-0020	U	0	SR	57.7 MG/KG	N		690 N		690 N	N			5.9	
LF12	ST-LF12-0004	U	0	SR	64.7 MG/KG	N		690 N		690 N	N			5.8	
LF12	ST-LF12-0004	U	0	SR	64.7 MG/KG	N		690 N		690 N	N			5.8	
LF12	ST-SVS7E-0019	U	0	SR	67 MG/KG	N		690 N		690 N	N			5.3	
LF12	ST-SVS7E-0019	U	0	SR	67 MG/KG	N		690 N		690 N	N			5.3	
LF12	PTX13-2722	B	0	SR	80.6 MG/KG >	N		690 N		690 N	N			10.9	
LF12	PTX13-2722	B	0	SR	80.6 MG/KG >	N		690 N		690 N	N			10.9	
LF12	PTX13-2725	B	0	SR	86 MG/KG >	N		690 N		690 N	N			10.9	
LF12	PTX13-2725	B	0	SR	86 MG/KG >	N		690 N		690 N	N			10.9	
LF12	PTX07-2J01	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N			0.25	
LF12	PTX07-2J01	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N			0.25	
LF12	PTX07-2J01	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N			0.25	
LF12	PTX07-2J01	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N			0.25	

correct  
"

Sr-1

LF12	PTX13-2725	B	2 SR	93.7 MG/KG >	N	44	690 N	44	690 N	N	11
LF12	PTX13-2725	B	2 SR	93.7 MG/KG >	N		690 N		690 N	N	11
LF12	PTX13-2725	B	2 SR	93.7 MG/KG >	N		690 N		690 N	N	11
LF12	PTX13-2725	B	2 SR	93.7 MG/KG >	N		690 N		690 N	N	11
LF12	ST-SVS7E-0021	U	0 SR	98.1 MG/KG	N		690 N		690 N	N	5.4
LF12	ST-SVS7E-0021	U	0 SR	98.1 MG/KG	N		690 N		690 N	N	5.4
LF12	ST-LF12-0005	U	0 SR	108 MG/KG	N		690 N		690 N	N	5.9
LF12	ST-LF12-0005	U	0 SR	108 MG/KG	N		690 N		690 N	N	5.9
LF12	PTX13-2724	B	2 SR	110 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2724	B	2 SR	110 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2724	B	2 SR	110 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2724	B	2 SR	110 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	2 SR	114 MG/KG >	N		690 N		690 N	N	10.8
LF12	PTX13-2723	B	0 SR	115 MG/KG >	N		690 N		690 N	N	10.7
LF12	PTX13-2723	B	0 SR	115 MG/KG >	N		690 N		690 N	N	10.7
LF12	PTX13-2723	B	2 SR	116 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2723	B	2 SR	116 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2723	B	2 SR	116 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2723	B	2 SR	116 MG/KG >	N		690 N		690 N	N	11.1
LF12	PTX13-2721	B	0 SR	117 MG/KG >	N		690 N		690 N	N	11.2
LF12	PTX13-2721	B	0 SR	117 MG/KG >	N		690 N		690 N	N	11.2
LF12	ST-SVS7E-0031	U	0 SR	120 MG/KG	N		690 N		690 N	N	5.7
LF12	ST-SVS7E-0031	U	0 SR	120 MG/KG	N		690 N		690 N	N	5.7
LF12	PTX13-2724	B	0 SR	132 MG/KG >	N		690 N		690 N	N	10.9
LF12	PTX13-2724	B	0 SR	132 MG/KG >	N		690 N		690 N	N	10.9
LF12	ST-LF12-0011	U	0 SR	169 MG/KG	N		690 N		690 N	N	0.29
LF12	ST-LF12-0011	U	0 SR	169 MG/KG	N		690 N		690 N	N	0.29
LF13	PTX07-2K10	B	0 SR	44 MG/KG	N		690 N		690 N	N	2.2
LF13	PTX07-2K08	B	0 SR	49 MG/KG	N		690 N		690 N	N	2.3
LF13	PTX07-2K05	B	2 SR	60.4 MG/KG >	N		690 N		690 N	N	0.22

Sr -2

LF13	PTX07-2K05	B	2 SR	60.4 MG/KG >	N	44	690 N	44	690 N	N	0.22
LF13	PTX07-2K02	B	1 SR	103 MG/KG >	N		690 N		690 N	N	1.1
LF15	PTX07-2M09	U	0 SR	47.2 MG/KG	N		690 N		690 N	N	0.24
LF15	PTX07-4M03	U	0 SR	47.9 MG/KG >	N		690 N		690 N	N	0.23
LF15	ST-LF15-0011	U	0 SR	49 MG/KG	N		690 N		690 N	N	6
LF15	PTX07-3M01	U	1 SR	49.8 MG/KG >	N		690 N		690 N	N	0.27
LF15	PTX07-2M03	U	0 SR	50.7 MG/KG	N		690 N		690 N	N	0.23
LF15	ST-LF15-0008	U	0 SR	52.1 MG/KG	N		690 N		690 N	N	5.6
LF15	PTX07-2M14	U	0 SR	52.5 MG/KG	N		690 N		690 N	N	0.09
LF15	PTX07-3M10	U	0 SR	53.4 MG/KG	N		690 N		690 N	N	0.24
LF15	PTX07-2M19	U	0 SR	58.8 MG/KG	N		690 N		690 N	N	0.09
LF15	PTX07-2M02	U	0 SR	68.8 MG/KG	N		690 N		690 N	N	0.24
LF15	PTX07-4M02	U	0 SR	70.1 MG/KG >	N		690 N		690 N	N	0.25
LF15	PTX07-2M26	U	0 SR	71.1 MG/KG	N		690 N		690 N	N	0.09 N
LF15	PTX07-2M18	U	0 SR	76 MG/KG	N		690 N		690 N	N	0.09
LF15	PTX07-2M24	U	0 SR	80.3 MG/KG	N		690 N		690 N	N	0.09 N
LF15	PTX07-2M16	U	0 SR	82.1 MG/KG	N		690 N		690 N	N	0.08
LF15	PTX07-2M13	U	0 SR	84.1 MG/KG	N		690 N		690 N	N	0.08
LF15	PTX07-2M17	U	0 SR	86.7 MG/KG	N		690 N		690 N	N	0.08
LF15	PTX07-4M01	U	0 SR	89.6 MG/KG >	N		690 N		690 N	N	0.24
LF15	PTX07-3M01	U	0 SR	95.3 MG/KG >	N		690 N		690 N	N	0.24
LF15	PTX07-4M02	B	2 SR	99.5 MG/KG >	N		690 N		690 N	N	0.23
LF15	PTX07-4M02	B	2 SR	99.5 MG/KG >	N		690 N		690 N	N	0.23
LF15	PTX07-2M08	U	0 SR	101 MG/KG	N		690 N		690 N	N	0.23
LF15	ST-LF15-0009	U	0 SR	104 MG/KG	N		690 N		690 N	N	5.6
LF15	PTX07-2M01	U	0 SR	106 MG/KG	N		690 N		690 N	N	0.24
LF15	PTX07-2M28	U	0 SR	106 MG/KG	N		690 N		690 N	N	0.09 N
LF15	PTX07-2M27	U	0 SR	115 MG/KG	N		690 N		690 N	N	0.09 N
LF15	PTX07-2M04	U	0 SR	144 MG/KG	N		690 N		690 N	N	0.24
SVS6	ST-SVS6-0009	U	0 SR	44.3 MG/KG	N		690 N		690 N	N	6
SVS6	ST-SVS6-0010	U	0 SR	45.8 MG/KG	N		690 N		690 N	N	6.3
SVS6	ST-SVS6-0003	U	0 SR	46.2 MG/KG	N		690 N		690 N	N	6.2
svs6	PTX13-2608	U	0 SR	48.3 MG/KG	N		690 N		690 N	N	2.4 J
SVS6	ST-SVS6-0006	U	0 SR	52.1 MG/KG	N		690 N		690 N	N	6.1
SVS6	ST-SVS6-0002	U	0 SR	54 MG/KG	N		690 N		690 N	N	5.8
svs6	PTX13-2604	B	0 SR	77 MG/KG >	N		690 N		690 N	N	11.2
svs6	PTX13-2603	B	0 SR	101 MG/KG >	N	✓	690 N	✓	690 N	N	11.1

svs6	PTX13-2602	U	0 SR	101 MG/KG >	N	44	690 N	44	690 N	N	11
svs6	PTX13-2603	B	0 SR	103 MG/KG >	N		690 N		690 N	N	11.1
svs6	PTX13-2619	U	0 SR	103 MG/KG >	N		690 N		690 N	N	11.1
svs6	PTX13-2619	U	0 SR	103 MG/KG >	N		690 N		690 N	N	11.1
svs6	PTX13-2620	U	0 SR	108 MG/KG >	N		690 N		690 N	N	10.9
svs6	PTX13-2623	B	0 SR	122 MG/KG >	N		690 N		690 N	N	11.2
svs6	PTX13-2605	B	0 SR	127 MG/KG	N		690 N		690 N	N	2.2 J
svs6	PTX13-2610	U	0 SR	136 MG/KG >	N		690 N		690 N	N	10.8
svs6	PTX13-2617	B	0 SR	139 MG/KG >	N		690 N		690 N	N	11
svs6	PTX13-2601	U	0 SR	141 MG/KG >	N		690 N		690 N	N	11.1
svs6	PTX13-2618	B	0 SR	142 MG/KG >	N		690 N		690 N	N	11
svs6	PTX13-2606	B	0 SR	150 MG/KG	N		690 N		690 N	N	2.3 J
svs6	PTX13-2609	U	0 SR	164 MG/KG	N		690 N		690 N	N	2.2 J
svs6	PTX13-2624	U	0 SR	195 MG/KG >	N		690 N		690 N	N	11.1
svs6	PTX13-2624	U	0 SR	197 MG/KG >	N		690 N		690 N	N	11.1
SVS7A	ST-SVS7G-0001	U	0 SR	45 MG/KG	N		690 N		690 N	N	6
SVS7A	ST-SVS7D-0008	U	0 SR	45.2 MG/KG	N		690 N		690 N	N	5.5
SVS7A	ST-SVS7G-0004	U	0 SR	45.3 MG/KG	N		690 N		690 N	N	6
SVS7A	PTX13-2702	B	0 SR	47.6 MG/KG >	N		690 N		690 N	N	10.9
SVS7A	ST-SVS7G-0016	U	0 SR	48.4 MG/KG	N		690 N		690 N	N	5.6
SVS7A	PTX13-2704	B	0 SR	48.6 MG/KG >	N		690 N		690 N	N	11
SVS7A	PTX13-2710	B	2 SR	48.8 MG/KG >	N		690 N		690 N	N	11
SVS7A	PTX13-2710	B	2 SR	48.8 MG/KG >	N		690 N		690 N	N	11
SVS7A	PTX13-2705	B	2 SR	49.2 MG/KG >	N		690 N		690 N	N	11.8
SVS7A	PTX13-2705	B	2 SR	49.2 MG/KG >	N		690 N		690 N	N	11.8
SVS7A	ST-SVS7G-0009	U	0 SR	49.4 MG/KG	N		690 N		690 N	N	5.3
SVS7A	ST-SVS7D-0013	U	0 SR	50.3 MG/KG	N		690 N		690 N	N	5.6
SVS7A	ST-SVS7D-0009	U	0 SR	50.9 MG/KG	N		690 N		690 N	N	5.5
SVS7A	PTX13-2710	B	0 SR	51.4 MG/KG >	N		690 N		690 N	N	10.8
SVS7A	PTX13-2704	B	2 SR	52.4 MG/KG >	N		690 N		690 N	N	11.6
SVS7A	PTX13-2704	B	2 SR	52.4 MG/KG >	N		690 N		690 N	N	11.6
SVS7A	ST-SVS7G-0004	U	0 SR	53.3 MG/KG	N		690 N		690 N	N	6
SVS7A	PTX13-2708	B	2 SR	54 MG/KG >	N		690 N		690 N	N	11.1
SVS7A	PTX13-2708	B	2 SR	54 MG/KG >	N		690 N		690 N	N	11.1
SVS7A	PTX13-2705	B	0 SR	55.3 MG/KG >	N		690 N		690 N	N	11
SVS7A	PTX13-2708	B	2 SR	55.9 MG/KG >	N		690 N		690 N	N	11.1
SVS7A	PTX13-2708	B	2 SR	55.9 MG/KG >	N	✓	690 N	✓	690 N	N	11.1

Sr-4

SVS7A PTX13-2703	B	2	SR	56.7 MG/KG >	N	44	690 N	44	690 N	N	11.3
SVS7A PTX13-2703	B	2	SR	56.7 MG/KG >	N		690 N		690 N	N	11.3
SVS7A ST-SVS7G-0008	U	0	SR	60.6 MG/KG	N		690 N		690 N	N	5.2
SVS7A PTX13-2703	B	2	SR	61.2 MG/KG >	N		690 N		690 N	N	11.4
SVS7A PTX13-2703	B	2	SR	61.2 MG/KG >	N		690 N		690 N	N	11.4
SVS7A ST-SVS7D-0003	U	0	SR	66.3 MG/KG	N		690 N		690 N	N	5.9
SVS7A ST-SVS7D-0004	U	0	SR	69.5 MG/KG	N		690 N		690 N	N	5.9
SVS7A PTX13-2703	B	0	SR	69.6 MG/KG >	N		690 N		690 N	N	11.1
SVS7A PTX13-2701	B	0	SR	70.5 MG/KG >	N		690 N		690 N	N	10.9
SVS7A PTX13-2702	B	2	SR	81.2 MG/KG >	N		690 N		690 N	N	11.1
SVS7A PTX13-2702	B	2	SR	81.2 MG/KG >	N		690 N		690 N	N	11.1
SVS7A PTX13-2709	B	0	SR	82.2 MG/KG >	N		690 N		690 N	N	10.3
SVS7A PTX13-2709	B	0	SR	82.2 MG/KG >	N		690 N		690 N	N	10.3
SVS7A PTX13-2707	B	0	SR	94.7 MG/KG >	N		690 N		690 N	N	10.9
SVS7A PTX13-2706	B	2	SR	97.6 MG/KG >	N		690 N		690 N	N	10.3
SVS7A PTX13-2706	B	2	SR	97.6 MG/KG >	N		690 N		690 N	N	10.3
SVS7A PTX13-2706	B	0	SR	109 MG/KG >	N		690 N		690 N	N	10.8
SVS7A PTX13-2708	B	0	SR	148 MG/KG >	N		690 N		690 N	N	10.5
SVS7A PTX13-2701	B	2	SR	151 MG/KG >	N		690 N		690 N	N	11.1
SVS7A PTX13-2701	B	2	SR	151 MG/KG >	N		690 N		690 N	N	11.1
SVS7A PTX13-2709	B	2	SR	323 MG/KG >	N		690 N		690 N	N	11
SVS7A PTX13-2709	B	2	SR	323 MG/KG >	N		690 N		690 N	N	11
SVS7B ST-SVS7C-0002	U	0	SR	44.9 MG/KG	N		690 N		690 N	N	6.2
SVS7B ST-SVS7A-0001	U	0	SR	45 MG/KG	N		690 N		690 N	N	6.2
SVS7B ST-SVS7F-0012	U	0	SR	45.9 MG/KG	N		690 N		690 N	N	5.6
SVS7B ST-SVS7A-0005	U	0	SR	47.5 MG/KG	N		690 N		690 N	N	6.2
SVS7B PTX13-2719	B	0	SR	47.7 MG/KG >	N		690 N		690 N	N	10.9
SVS7B ST-SVS7A-0009	U	0	SR	49.2 MG/KG	N		690 N		690 N	N	5.6
SVS7B PTX13-2726	B	0	SR	49.7 MG/KG >	N		690 N		690 N	N	11
SVS7B ST-SVS7C-0027	U	0	SR	50.4 MG/KG	N		690 N		690 N	N	5.5
SVS7B ST-SVS7F-0003	U	0	SR	50.8 MG/KG	N		690 N		690 N	N	6
SVS7B PTX13-2720	B	0	SR	51.9 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2716	B	0	SR	52.4 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2728	B	2	SR	52.6 MG/KG >	N		690 N		690 N	N	11.3
SVS7B PTX13-2728	B	2	SR	52.6 MG/KG >	N		690 N		690 N	N	11.3
SVS7B ST-SVS7C-0003	U	0	SR	52.7 MG/KG	N		690 N		690 N	N	6.1
SVS7B ST-SVS7C-0001	U	0	SR	53.2 MG/KG	N	↓	690 N	↓	690 N	N	5.4

Sr-5

SVS7B ST-SVS7A-0004	U	0	SR	53.9 MG/KG	N	44	690 N	44	690 N	N	6
SVS7B ST-SVS7C-0004	U	0	SR	55.3 MG/KG	N		690 N		690 N	N	5.8
SVS7B ST-SVS7F-0001	U	0	SR	58 MG/KG	N		690 N		690 N	N	5.3
SVS7B ST-SVS7B-0001	U	0	SR	59.5 MG/KG	N		690 N		690 N	N	6
SVS7B PTX13-2733	B	0	SR	59.6 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2733	B	0	SR	59.6 MG/KG >	N		690 N		690 N	N	10.9
SVS7B ST-SWMU11-0015	U	0	SR	59.8 MG/KG	N		690 N		690 N	N	0.29 N
SVS7B PTX13-2728	B	0	SR	60.4 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2718	B	2	SR	60.6 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2718	B	2	SR	60.6 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2718	B	2	SR	60.6 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2718	B	2	SR	60.6 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2718	B	2	SR	60.6 MG/KG >	N		690 N		690 N	N	11
SVS7B ST-SVS7B-0003	U	0	SR	61 MG/KG	N		690 N		690 N	N	6.1
SVS7B ST-SVS7C-0003	U	0	SR	63.4 MG/KG	N		690 N		690 N	N	6.1
SVS7B PTX13-2734	B	2	SR	66.3 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2734	B	2	SR	66.3 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2718	B	0	SR	67.7 MG/KG >	N		690 N		690 N	N	10.8
SVS7B PTX13-2713	B	2	SR	73.2 MG/KG >	N		690 N		690 N	N	11.4
SVS7B PTX13-2713	B	2	SR	73.2 MG/KG >	N		690 N		690 N	N	11.4
SVS7B PTX13-2734	B	0	SR	78 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2731	B	0	SR	79.3 MG/KG >	N		690 N		690 N	N	10.8
SVS7B PTX13-2731	B	2	SR	80.5 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2731	B	2	SR	80.5 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2719	B	2	SR	81.9 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2719	B	2	SR	81.9 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2711	B	2	SR	83 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2711	B	2	SR	83 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2713	B	2	SR	86.9 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2713	B	2	SR	86.9 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2732	B	0	SR	90.1 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2714	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2714	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2714	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2714	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2714	B	2	SR	91.8 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2735	B	0	SR	99.3 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2730	B	2	SR	103 MG/KG >	N		690 N		690 N	N	11.5
SVS7B PTX13-2730	B	2	SR	103 MG/KG >	N		690 N		690 N	N	11.5

Sr-6



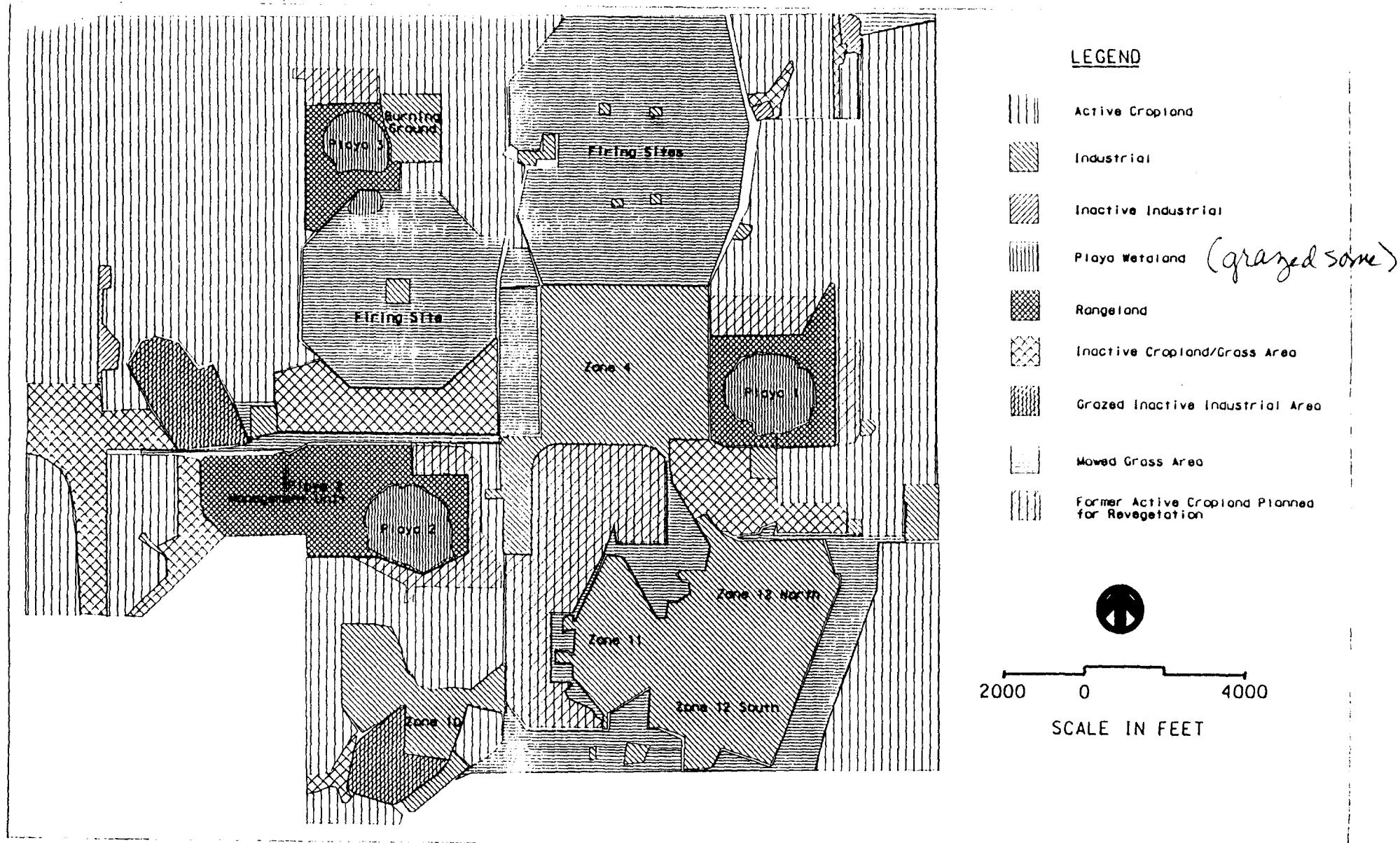
SVS7B PTX13-2711	B	0 SR	105 MG/KG >	N	44	690 N	44	690 N	N	10.9
SVS7B PTX13-2729	B	0 SR	105 MG/KG >	N		690 N		690 N	N	10.7
SVS7B PTX13-2735	B	2 SR	113 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2735	B	2 SR	113 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2717	B	0 SR	117 MG/KG >	N		690 N		690 N	N	10.9
SVS7B PTX13-2712	B	0 SR	120 MG/KG >	N		690 N		690 N	N	12.3
SVS7B PTX13-2717	B	2 SR	127 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2717	B	2 SR	127 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2730	B	0 SR	128 MG/KG >	N		690 N		690 N	N	10.8
SVS7B PTX13-2715	B	0 SR	130 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2727	B	0 SR	130 MG/KG >	N		690 N		690 N	N	11.2
SVS7B PTX13-2729	B	2 SR	144 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2729	B	2 SR	144 MG/KG >	N		690 N		690 N	N	11
SVS7B PTX13-2714	B	0 SR	145 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2713	B	0 SR	147 MG/KG >	N		690 N		690 N	N	11
SVS7B ST-SVS7A-0003	U	0 SR	154 MG/KG	N		690 N		690 N	N	6
SVS7B ST-SVS7A-0003	U	0 SR	160 MG/KG	N		690 N		690 N	N	6.1
SVS7B PTX13-2715	B	2 SR	161 MG/KG >	N		690 N		690 N	N	11.1
SVS7B PTX13-2715	B	2 SR	161 MG/KG >	N		690 N		690 N	N	11.1
SVS7B ST-SVS7B-0023	U	0 SR	177 MG/KG	N		690 N		690 N	N	5.6

Sr-7

## APPENDIX B

Locations of agricultural activities at the Pantex Plant identified by DOE in 1995.

DOE provided no current figure in its *Final RCRA Facility Investigation Report, Independent Sites at USDOE Pantex Plant* (January 2004) for evaluation.



c:\dgn\habitat.dgn Apr. 11. 1995 12:38:31

Figure 3a. Generalized Habitat Areas Main Plant

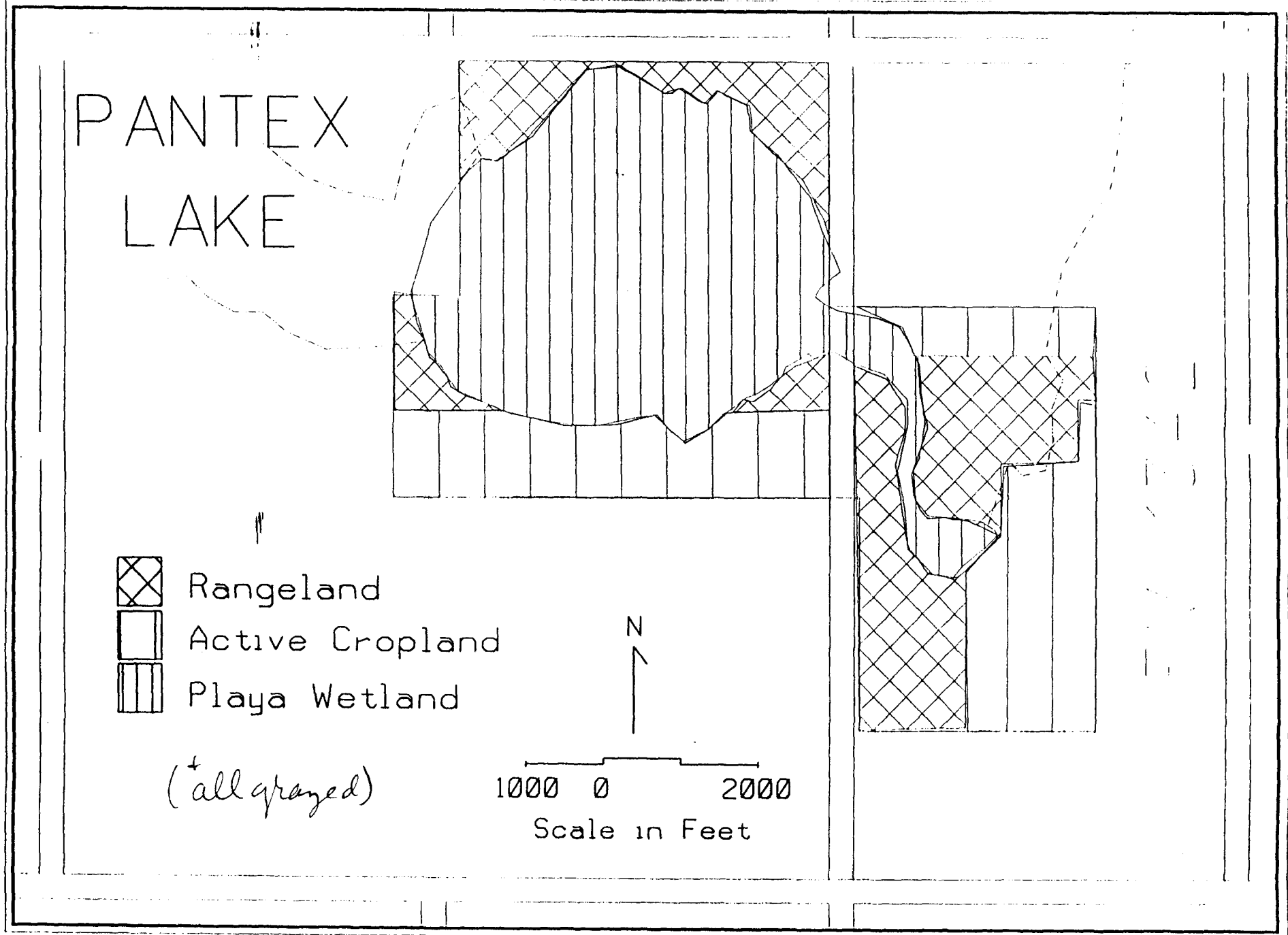


Figure 3b. Generalized Habitat Areas Pantex Lake

***Pantex Plant Radiological Investigation Report, 2004***  
**Want to know more? – Citizens' Public Meeting**

<p><b>Monday – June 7, 2004</b> <b>1 – 3 p.m.</b> <b>Carson County Square House Museum</b> <b>Panhandle, Texas</b></p>
--

***Independent review & citizens' discussion with EPA & TCEQ***

On behalf of citizens, scientists from IEER have reviewed the *Pantex Radiological Investigation Report*. Please attend this important meeting to learn about their review. Are radionuclides a cleanup concern at Pantex – or not?

***The Pantex Groundwater Roundtable will follow (4–6:30 pm)***

The Department of Energy at Pantex refused our request for IEER scientists to make their presentation at this evening meeting, when members of the community that work during the day might be able to attend.

Please contact STAND at (806) 358-2622 if you are interested in the topic,  
but are unable to attend.



The Cadmus Group

Statistical Analysis of Metal Concentrations in Soils (Playa Soils)

	Total # samples	Original Y #	Original Y %	Median Y #	Median Y %	Med (Ufull) Y #	Med (Ufull) Y %	Med (Uhalf) Y #	Med (Uhalf) Y %
Silver (MG/KG)	97	51	52.58			56	57.73	58	59.79
Aluminum (MG/KG)	32	1	3.13	15	46.88				
Arsenic (MG/KG)	76	0	0.00	25	32.89				
Boron (MG/KG)	32	0	0.00	8	25.00	8	25.00	8	25.00
Barium (MG/KG)	94	2	2.13	76	80.85				
Beryllium (MG/KG)	94	1	1.06	13	13.83				
Calcium (MG/KG)									
Cadmium (MG/KG)	96	5	5.21	15	15.63	37	38.54	43	44.79
Cobalt (MG/KG)	94	1	1.06	28	29.79				
Chromium (MG/KG)	97	33	34.02	65	67.01				
Hexavalent Chromium (MG/KG)	36	0	0.00			1	2.78	1	2.78
Copper (MG/KG)	94	28	29.79	66	70.21				
Iron (MG/KG)									
Mercury (MG/KG)	68	31	45.59	31	45.59	33	48.53	33	48.53
Potassium (MG/KG)									
Magnesium (MG/KG)									
Manganese (MG/KG)	94	1	1.06	31	32.98				
Molybdenum (MG/KG)	32	1	3.13	5	15.63	5	15.63	5	15.63
Sodium (MG/KG)									
Nickel (MG/KG)	94	1	1.06	32	34.04				
Lead (MG/KG)	86	4	4.65	44	51.16				
Antimony (MG/KG)	94	0	0.00	1	1.06	10	10.64	20	21.28
Selenium (MG/KG)	68	0	0.00	31	45.59	34	50.00	34	50.00
Sulfate (MG/KG)									
Strontium (MG/KG)	94	57	60.64	81	86.17				
Thallium (MG/KG)	94	0	0.00	1	1.06	2	2.13	4	4.26
Vanadium (MG/KG)	94	8	8.51	58	61.70				
Zinc (MG/KG)	94	19	20.21	52	55.32				
Tin	32	17	53.13						

<b>Overall</b>	<b>1751</b>	<b>244</b>	<b>13.93</b>						
<b>Overall using new med values</b>	<b>1751</b>	<b>792</b>	<b>45.23</b>						

(64 Y with no background)

678	38.72	186	10.62	206	11.76
		92 Y		186 Y	
		94 Unique		20 Unique	



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**Comments on the Pantex Plant Radiological Investigation Report**

Brice Smith, Ph.D. and Arjun Makhijani Ph.D.  
Institute for Energy and Environmental Research, Takoma Park, Maryland

Prepared for Serious Texans Against Nuclear Dumping

*revised June 9, 2004*

The following are the comments prepared by the Institute for Energy and Environmental Research on the January 2004 *Pantex Plant Radiological Investigation Report*, henceforth referred to as the RI report,. We have prepared this analysis for Serious Texans Against Nuclear Dumping (STAND) pursuant to a Technical Assistance Grant made to STAND by the U.S. Environmental Protection Agency.

**Main findings and recommendations**

There is a substantial amount of evidence in the RI report that measurement protocols or analysis or laboratory techniques, or some combination of these factors have led to many of the reported measurements being anomalous or at odds with basic, established principles of uranium radiochemistry. Specifically, the isotopic ratios of U-235 to U-238 in soil samples and in groundwater samples appear to have significant errors. The tritium analysis is also unsatisfactory. The lack of a valid background for uranium, tritium, and plutonium for the Pantex site contributes to the fundamental deficiencies of the RI report. The RI report even provides soil screening results that violate basic physics. The RI report provides screening results that are literally incredible. The RI report screening levels imply that dumping vast amounts (millions or billions of tons) of *pure* plutonium, uranium, or tritium on the site would not threaten the groundwater. We find that the contractor and the DOE have failed to provide credible data or a credible analysis in this RI report. The RI report's authors review of process information complemented by worker interviews is an important part of producing a sound RI; however, despite the considerable effort, the final product is not scientifically sound in many essential aspects.

Our principal recommendation regarding the RI report is that this report needs to be redone with new field data based on samples that are properly analyzed by laboratories that have recently be certified by the Environmental Measurements Laboratory for the specific radionuclides at issue: uranium and plutonium isotopes, tritium, as well as some fission products that may have been used in experiments. Reliable background values for the Pantex site for uranium and plutonium should be established and published as part of the new RI report. A reliable background for tritium in groundwater in the general area of the plant needs

to be established for both perched aquifers and the Ogallala aquifer. The active oversight of the EPA in this process is needed. The fact that this final RI report that is so flawed could have been published, without the basic errors having been eliminated at the draft stage, indicates a failure of the quality assurance and quality control procedures. This means that far more active EPA oversight is needed in the preparation of a valid RI report. The EPA should require that the new RI report be published in draft form for public comment so that the kinds of severe problems that are in the current version do not recur in the new final Report. DOE and its contractors also need to strengthen their internal review procedures and their quality assurance and quality control processes.

The detailed basis for these statements are provided below, as are point-by-point recommendations.

### *I. Deficient Documentation of Waste Management Facilities and Practices*

Throughout the RI report, the authors rely heavily on the assumption that a review of historical documentation and worker interviews is sufficient to characterize which sites were potentially impacted by radionuclide releases. A site walk-through was conducted based on this review; in addition, an aerial site survey was also undertaken. However, primary reliance was placed on the assumed knowledge of plant processes in order to identify which sites were potentially impacted and which radionuclides were contaminants of potential concern at those sites. There are a number of instances in which process knowledge and historical memory of waste management practices at the Pantex site were incomplete or inaccurate, raising questions about the completeness and accuracy of the RI report

Examples of such incomplete or inaccurate information are:

#### **SWMU 57 - Landfill 6 (p. 5-43 to 5-45, F-19)**

The date the landfill began operation is not known. More importantly, the landfill was thought to be located next to Building 12-95, however it was instead found "near" Building 12-94. This landfill is stated to be approximately 6,500 square feet in area.

#### **SWMU 73 - Firing Site 15 (p. 5-80)**

In 1977, one test shot "reportedly" involved strontium-89 (Sr-89) contaminated with some amount of strontium-90 (Sr-90). Interviews with employees led to the eventual conclusion by the authors that the test never, in fact, took place and that it "was probably confused with another test performed in 1956," involving radiolanthanum at the same site (Firing Site FS-15). This issue remains unresolved in our view. A failure to find Sr-90 at the site cannot be regarded as a reliable indicator of a conclusion that the report of the incident (whatever that was) was "probably" wrong and that the test did not happen. Sr-89 has a relatively short half-life (about 50 days), and would not be expected to be found at the site today if a test had been conducted in 1977. Since Sr-90 was admittedly a trace contaminant, it would require very detailed sampling to find traces of the test, especially as it may be difficult or impossible to separate the remaining traces from atmospheric testing fallout. It is also possible that the test was conducted at another Firing Site. The RI report does not give any citation as to what the term "reportedly" refers to in its statement that "In 1977, one test reportedly involved the use of explosive containing <sup>89</sup>Sr as a tracer...." (p. 5-80) To conclude that a test that supposedly happened in 1977 was confused with a test involving completely different radionuclides more than twenty years earlier at the same site is flimsy science at best. Even the personnel who were interviewed to conclude that the report about the test (whatever that was) was wrong are not identified. The lack of documentation does not allow any independent judgment to be made on the issue. The question whether this test was actually conducted, and whether there were other tests that may have been done should be investigated afresh, with all documentation and interviews published. We recommend



that all documents and texts of interviews relating to this incident and its investigation be published.

SWMU 82 - NWAR (p. 5-84)

The waste storage trench in the Nuclear Weapons Accident Residue area was alternatively reported as being 15 x 15 x 165 feet or 14 x 8 x 100 feet in size. This is a difference in volume of almost 26,000 cubic feet (960 cubic yards). The upper volume estimate is more than 3.3 times the lower estimate. Here also there is a passive voice reference to the dimensions of the waste site which "have alternately been reported as...." This is an unacceptable way to present "data," if indeed it can be dignified with that name at all. We recommend that a more precise and scientifically defensible waste volume estimate be developed. Other waste site volumes should be verified and the methods for assessing waste volume should be published.

SWMU 135 : Building 12-44E Subsurface Leaching Beds (p. F-17 to F-18)

It was believed that there was a 100 x 50 ft leach bed to the southwest of Building 12-44E. This is the building where employees involved in the 1961 plutonium dispersal incident might have showered allowing plutonium to be washed down the drain. From site investigations and examinations of the building drawings, the authors of the RI report believe that the effluent went to the sewage plant instead and that no leach bed was ever built in the location. We do not agree that process knowledge and worker interviews are a sufficient basis to dismiss the potential for plutonium contamination in this area without additional sufficient radionuclide sampling throughout the site, especially in light of the evidence of other technical deficiencies and poor science that we discuss in our review. Further, the construction worker plutonium screening levels are very high (see discussion below) – more than ten times the levels used for cleanup in the Marshall Islands. The residential farmer scenario should be used throughout for evaluating screening levels and not just for the single case of the closed firing site for which it was applied in the RI report. Recommendations: This SWMU should be carefully sampled for plutonium. A sampling plan for plutonium in this and other areas where plutonium contamination is suspected should be published. The new draft RI report should reflect the resulting plutonium measurements.

SWMUs 37 to 44 : Landfills (p. F-56)

The Burning Ground Landfills "appear to have consisted of nine distinct unlined burial trenches" according to the authors. Landfills 16 and 17 are believed to potentially contain depleted uranium waste, which was allowed to be buried as non-radioactive waste if it had less than 500 disintegrations per minute of alpha per 100 cm<sup>2</sup> prior to 1984. There is still significant uncertainty about the extent of these sites

Unassigned SWMU : Landfill 18 North of Firing Site 10 (p. F-68)

There was believed to be a landfill in the area of Firing Site 10, however, none was found following a geophysical survey, the use of ground penetrating radar, and the examination of three soil borings. It was eventually concluded by the authors that no landfill was built in this area.

The opening dates are unknown or uncertain for SWMU 60 : Landfill 9, AOC 8c : Pad 11-17 Solvent Releases, Explosive Burn Pads, and SWMU 58 : Landfill 7. In addition there are also conflicting reports of when Landfill 7 was closed; one source says 1959 and another says 1977. Many of these sites are assumed to involve non-radioactive contaminants. (p. F-4, F-5, F-55, and F-72)

The volume of waste water sent into the ditches and playas is not known, but only estimated.

Estimates for the release volumes are

Playa 1 from Zone 12	224,000 gallons per day (gpd) (p. 3-8)
Playa 1 from Zone 11	66,000 gpd (p. 3-8)
Pantex Lake from sewage plant	300,000 to 500,000 gpd (p. H-17)

Based upon these gaps or inaccuracies in the historical information concerning radionuclide and other toxic material disposal on site, it does not seem credible that a document review accompanied by interviews can be considered sufficient to determine the status of all areas of the Pantex site. Recommendations: Areas where there is a plausible pathway for contamination, for instance Pantex Lake which received treated waste water from the Old Sewage Treatment Plant that was involved with at least one possible plutonium release, should be treated as potential radiation sites and fully investigated. Such a full investigation should involve sufficient sampling points at various depths that screen for plutonium as well as uranium, thorium, and tritium. In addition, this expanded conception of what constitutes a potentially contaminated site should also be considered when a new sampling effort is undertaken to determine a meaningful background level for the site. Finally a survey using such techniques as ground penetrating radar must be undertaken to ensure that no landfills or other waste management areas goes undetected. Estimates should be made for all effluents to the various playas, including playas 2 and 4 before and after 1970 and reported in the RI report.

## *II. Calculation of Radiation Screening Levels*

We have not had sufficient time or resources to review the details of the methodology or assumptions used in the calculation of the radiological risks associated with the exposure of Industrial or Construction Workers to the soils at Pantex, however, we do have a number of general comments concerning the results. First, Construction Workers at DOE sites are often asked to do radiological work, in addition to new construction in non-contaminated areas. This was not considered in the screening level calculation. The soil screening levels would be lower if this factor were included. Second, the exposure time of 60 days for Construction Workers should be discussed in the context of previous projects at Pantex and any potential future plans (such as the possibility of the Modern Pit Facility being located at the site). If Construction Workers are employed for a total of 3 years or more on a job, their calculated tolerance level for residual Pu-239, Th-232, and U-234 in the soil could drop below that of the Industrial Worker. (p. 5-28 to 5-29) Fourth, the reported total uranium limits and those for the uranium activity are in conflict in both the Industrial Worker and Construction Worker Preliminary Remediation Goal calculations. For the Industrial Worker, the maximum amount of uranium allowed in the soil in order to meet the activity limits is 5.2 mg of U per kg of soil whereas the total uranium limit as listed is 613 mg/kg. The listed limit is nearly 120 times larger than that implied by the radiation limits. For the Construction Worker, the total uranium limit implies a maximum U-238 activity in the soil of 88 pCi/gm, whereas the limit given in the RI report's table is 138 pCi/gm. The listed value is more than 55% larger than that implied by the total uranium limit. (p. 5-34) Finally, the RI report's consideration of the permissible levels of the radionuclides is based on only the Industrial Worker and Construction Worker scenarios. (p. 5-28 to 5-30) This implicitly assumes that the land will never be put to other than industrial uses. Given the importance of the area surrounding the Pantex plant for agricultural production and the extremely long half-life of the contaminants of potential concern compared to human institutions, a calculation for a subsistence farmer family should be made and should be the reference scenario for all long-term calculations (beyond a few decades). A subsistence farmer calculation, was done for the Firing Site 5; it is discussed in a subsequent section.

In addition to the Preliminary Remediation Goals based on the worker scenarios, the authors also consider the screening levels appropriate to the protection of the groundwater based on migration of the radionuclides through the soil.

The sole use of analytical modeling for the transport of radionuclides is not adequate to insure the protection of groundwater. In Appendix E, the justification for the choice of the K<sub>d</sub> values, which is the parameter that

describes how quickly material in the soil moves into the water, is entirely based on using reported values for soils with similar clay content and pH. The values of  $K_d$  are known to be difficult to determine even with extensive measurements and that they are often variable over even fairly short ranges in natural soils. The choice of parameters without actual onsite measurements is not appropriate, and given the unphysical results of the models used for the soils screening levels (see below) the choice of all input parameters to their model as well as the model itself should be independently reviewed and supported by site specific measurements. Part of this external review should include a review of assumptions such as that the playas and ditches, which are the areas of greatest concern regarding groundwater contamination, were a “minor” pathway. Given that the playas and ditches were historically the dumping ground for vast amounts of industrial wastewater, it is not credible to assume *a priori* that the transport of potential contamination to these areas was “limited.” (p. 4-4)

An additional comment concerning the  $K_d$  values is that Table E-7 reports a straight average value for the Blackwater Draw and upper Ogallala formations. However, on page E-18 the authors list the typical depths of the Blackwater Draw formation as 80 feet and that of the upper Ogallala as 170 feet. Using these numbers to calculate a weighted average for the  $K_d$  values would reduce those listed in Table E-7 by 31% for uranium and 35% for plutonium.

In addition to our general comments on the RI report technique for determining the soil screening levels appropriate to groundwater protection, the results of their numerical models are reported as values that have no physical meaning and demonstrate a level of carelessness in the writing and review of this document we have observed in several areas. Even if the transport is assumed to be very slow, and thus large amounts of contaminants are required to threaten the aquifers, the Soil Screening Levels should be cut off at the values appropriate for a pure material. In other words, it does not make physical sense to speak of packing more than one kilogram of contaminant into one kilogram of total material. The only SSL that makes physical sense in this regard is that for tritium at the high recharge rate. All other values should have been limited to the following:

Radionuclide	Reported SSL	Physical Cutoff Representing Pure Material	Ratio (SSL/Physical Cut Off)
Tritium <sup>(*)</sup>	$7.28 \times 10^{21}$ pCi/gm	$9.64 \times 10^{15}$ pCi/gm	7.6E+05
Pu-239	$5.78 \times 10^{18}$ pCi/gm	$6.13 \times 10^{10}$ pCi/gm	9.4E+07
Th-232	$5.10 \times 10^{19}$ pCi/gm	$1.11 \times 10^5$ pCi/gm	4.6E+14
U-234	$9.7 \times 10^{18}$ pCi/gm	$6.2 \times 10^9$ pCi/gm	1.6E+09
U-235	$9.7 \times 10^{18}$ pCi/gm	$2.2 \times 10^6$ pCi/gm	4.4E+12
U-238	$9.7 \times 10^{18}$ pCi/gm	$3.3 \times 10^5$ pCi/gm	2.9E+13
Total Uranium	$2.89 \times 10^{22}$ mg/kg	$1 \times 10^6$ mg/kg	2.9E+16

(\*) Recharge = 0.044 in/year

Another way to look at the reasonableness of these values is that the reported total uranium screening level is nearly 29 trillion tons of uranium per kg of soil. This value would be roughly equivalent to several million times the total proven recoverable uranium reserves in the entire world stuffed into a single kilogram of Texas soil, which literally make no sense. The fact that nonsensical screening values have been included in the RI report throws into question the entire quality assurance process as well as the scientific competence of the preparers and validators of these results. We have seen poor science in the DOE before, but nothing that remotely resembles the numbers in the above table. We are therefore making a recommendation that is unprecedented for the Institute for Energy and Environmental Research: We recommend that the qualifications of the contractor staff responsible for the technical work should be published as we are mystified how such numbers could have wound up in a final official report.

Leaving the physical impossibility aside, the estimation of such high screening levels also throws into serious question the assumptions, such as rate of transport through the soil, on which these calculations are based. For instance, the calculations imply that even if vast amounts of pure plutonium, uranium, or tritium were disposed of in the soil, there would be essentially zero risk of any groundwater pollution. The entire set of assumptions, parameter values, and model runs should be published for independent evaluation. The calculations should also be repeated with more realistic values that take into account real-life experience in the migration of actinides through the environment. The above cited results are both wrong and literally incredible. We recommend that the EPA institute a process of quality assurance and quality control that is independent of the contractor and the DOE.

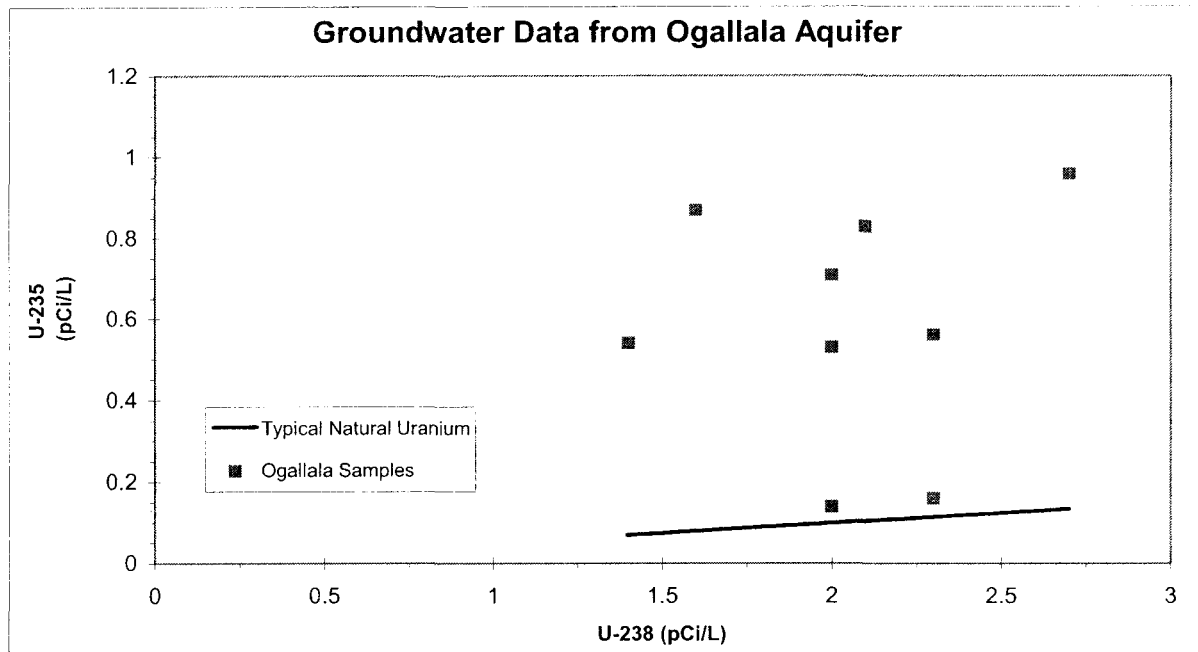
### *III. Determination of Uranium Background Levels*

Given the nature of the operations and waste management at Pantex, the primary radionuclide of potential concern at the largest number of sites is uranium. This fact makes the determination of a credible background for the site particularly important. As the data is currently presented, we do not have confidence that the background levels used in the RI report are correct for the Pantex site. We will discuss the deficiencies of their soil and groundwater data separately, however, they both share many of the same concerns.

In Appendix C the authors discuss two significant concerns with their background soil data. The first is that the measurements of the total uranium concentration are not consistent with the measurements of the amount of U-238. When it is assumed that all the mass of the uranium is attributable to U-238, the total uranium data systematically underestimates the activity when compared to the measured values (Figure C-3). In addition to this measurement problem, many of the observed ratios of U-235 to U-238 are far too large. Typically, for natural uranium this ratio is a little less than 5 percent. It is even lower for depleted uranium. Further the reported ratios of U-238 to U-235 are spread out by nearly an order of magnitude (Figure C-4). Both of these problems with the soil data are noted in the text; however, their serious implications for the validity of the site investigation are ignored. There is no explanation offered for the inconsistency in the total uranium measurement. The authors simply decide not to report a background value for the site and use other considerations for examining the specific areas at Pantex. In the case of the U-235 activity, the anomalous ratios are attributed to a supposed difficulty in measuring the low levels of U-235 involved (p. C-9). This is despite the fact that the authors acknowledge in the Quality Control discussion that due to its strong, penetrating gamma radiation, U-235 is in general easier and more accurate to measure than U-238. (p. I-7). In our opinion, these two anomalies in the data set taken together call into question its correctness and the adequacy of the laboratories technique and quality control/quality assurance program. Recommendation: The DOE should publish all of the lab certification data for all radionuclides analyzed by various laboratories, including the result of any tests conducted by the Environmental Measurements Laboratory in which the laboratories have participated.

The data taken to determine a background for the groundwater also raises additional questions. First, there was no successful attempt reported of a measurement for the background level in the perched aquifers. Considering that this water is used by individuals and that it is likely to be the first affected by plant operations, it is important that it be analyzed as part of the overall site survey. For the measurements of water from the Ogallala aquifer, we note that they again have anomalous isotope activity ratios that call the validity of the data set into question. The observed average ratio of U-234 activity to U-238 is found to be approximately 2.2. For natural uranium in secular equilibrium this ratio should be approximately one. It is known that in water, however, this ratio can be larger than one due to the different solubility of the decay products and the influence of alpha recoil. For instance the ratios of U-234 to U-238 in the Snake River aquifer under the Idaho National Engineering and Environmental Laboratory have been reported as varying naturally from 1.5 to 3.1. [2 p. 1-2] These values would be consistent with the observed ratios in the Ogallala. But the U-235 to U-238 measurements are again inconsistent with the ratios expected under

natural conditions. For instance, at location AW647, the U-235 activity is reported at 0.96 pCi/liter and for U-238 the value is given as 2.7 pCi/liter. A ratio of 0.36 for U-235 to U-238 activity is completely outside the range of expected value of about 0.05 for natural uranium (table C-10, p. C-88 and C-89). The RI report has offered no explanation for this problem. Below is a plot of the activity ratios for the 9 locations listed in the data tables as having a U-235 detection.



The solid line represents the expected ratios for natural uranium. Like for the soil samples, the ratios are too large and do not appear to show any obvious correlation. The activity ratios for the isotopes vary from 0.07 to 0.54, with an average of 0.3. This average ratio is 6 times that expected for typical natural uranium.

An additional concern regarding the groundwater data is that the values listed in Table C-10 are not consistent with the summary results given in Tables 3-5 (p. 3-23) and C-7 (p. C-31). In these two tables there are 26 measurements claimed for U-234 while only 11 distinct measurements are listed in Table C-10. These 11 reported data sample do, however, contain the minimum and maximum values reported in the summary tables (including the single data point considered to be an outlier). In addition, the summary tables list 11 out of 20 samples for U-235 as detections whereas Table C-10 lists only 9 samples as having a detection of U-235. The maximum U-235 measurement reported in the summary tables is 1.2 pCi/L whereas the maximum value listed in Table C-10 is 0.96 pCi/L. Finally, in Table C-7 the maximum value of U-234 should be listed as 8.8 pCi/L, not 7.2 pCi/L as reported.

These inconsistencies and anomalies in the measurements of uranium in both soil and groundwater are of significant concern considering the importance of this data to the site screening process and the fact that at least one site at the Burning Grounds requires further investigation due to uranium contamination. The data sets as they currently stand are unacceptable for use in the RI report. The U-235 to U-238 ratios are completely incompatible with natural or depleted uranium. A lack of correlation between the values of the two isotopes makes the problem even worse, because one cannot attribute any particular enrichment of uranium to the samples. Moreover, the same problem afflicts soil and water data. This leads us to conclude that the entire procedure for taking and analyzing samples, including the certification of the laboratory needs to be thoroughly and independently reviewed. If there are duplicates of the samples for which data are reported in the RI report, these should be re-analyzed by a laboratory that has recently passed

Environmental Measurements Laboratory (EML) certification for uranium. Further, the DOE and the site contractor must perform a credible, consistent, and reliable background assessment before considering which sites have been impacted. These background values should be independently verified. Both means and variances should be reported. All raw data should be published and laboratory uncertainties should be specified. The EPA also has a large job to do here given the unsatisfactory state of the data and the apparent lack of success in implementing quality assurance for the procedure by which the data are produced, analyzed and reported.

One additional concern regarding the acceptability of the RI report's treatment of uranium is that on page 2-20, the authors use a specific activity for the depleted uranium of 0.33  $\mu\text{Ci/gm}$ . This value is equal to the specific activity of pure U-238 as quoted by the Department of Energy. While it is correct that nearly all the mass in DU is attributable to U-238, a significant amount of activity continues to come from the remaining U-234. Due to this additional contribution, typical values for the specific activity of DU are 20% or more higher than the value they used in the RI report. Getting such an important and fundamental number incorrect is another example that demonstrates the need for the RI report to undergo a thorough external review by experienced individuals before it can be used for site screening and selection.

#### *IV. Screening Levels for Non-Carcinogenic Risks of Uranium*

An analysis of Firing Site 5, which had been closed for radiological hazards, but not for the chemical hazard of uranium is presented in the RI report. There was "little subsurface data" for FS-5 and therefore the RI used surface data, as well as what little subsurface data there was for the risk analysis. (p. K-2) A subsistence farmer scenario, which is an appropriate scenario to use, was adopted for the analysis.

The total cancer risk to the resident farmer was found to be  $0.9 \times 10^{-6}$  which is pretty close to the limit of  $1 \times 10^{-6}$ . This is important when looking at the combined risk from all other heavy metals (chemical) and uranium (radiological and chemical). (p. K-2) Different values of transport parameters may push this above the limit of one in a million risk.

In the calculation of the Construction Worker risk, an exposure duration of 0.23 years was used as well as an exposure frequency of 60 days per year resulting in a total exposure time of less than 14 days (i.e. 60 days/year  $\times$  0.23 years). Even if the total exposure time of 60 is accepted (which we have discussed before as needing to be justified in light of historical and projected future activity at Pantex) the Construction Worker risk as reported in the RI report should be multiplied by 4.35. (p. K-12) Making this correction for the total uranium risk would elevate it to an HI of 0.61 for the Construction Worker. If the same overall correction for the exposure time is made to the cumulative risk from the contaminants listed in Table K-3 than the total HI would be 1.52, well in excess of one. (p. K-6)

#### Summary of total uranium at FS-5

	Max(mg/kg)	95% UCL (mg/kg)	Max (pCi/gm)	95% UCL (pCi/gm)
HAA	580	148	265	68
LAA	150	75	69	34
Berm/Gravel Pit	510	364	233	167
Entire Site	580	177	265	81

(p. K-3)

These values of residual uranium are rather high. They may also result in a significant contribution to the radiological risk. Given that the soil screening calculations appear to be wrong and the observed mistake in the Construction Worker risk calculation, we cannot a priori accept the risk results from the levels of uranium cited above. We recommend the publication of all the assumptions in the analysis. We also

recommend that the EPA do an independent check on the DOE's work both in regard to radiological and non-radiological risks of uranium.

#### *V. Plutonium*

The RI report has several values of plutonium contamination in playas that appear to be above the background values one might expect from atmospheric testing fallout (pp. C-76 and C-77). These values appear to be above the detection limit. They cannot be presumptively dismissed as outliers. The "reasonable" lower limit for plutonium detection of 0.05 pCi/gm cited throughout the RI report is not adequately justified and is, in fact, well above the vast majority of the detection limits listed for plutonium in surface soil in Appendix C. (p. C-33 to C-86) In addition, as with the uranium results, the sample results cited in the text are not always consistent with those in the summary tables or the raw data. In Table 5-19 they list a total of 360 detections for plutonium out of 1156 samples in soils 0 to 2 feet below the surface. In the text discussing these results, however, they claim that "41 out of 494" results were above the 0.05 pCi/gm level, and that this represented "only 3% of the entire population." (p. 5-36 to 5-38) First of all, there were 1,156 samples taken with 360 reported detections, neither of which number is equal to 494. Forty-one is, in fact, 3.5% of the total number of samples, but is equal to 8.3% of 494. This carelessness with numbers casts further doubts on the results reported in the RI report.

Discharges of plutonium on to the site cannot be ruled out as sources of contamination of ditches and playa sediment. For instance, the 1961 plutonium dispersal event may have resulted in plutonium contamination being discharged on to the site via the laundry or the shower drain. Further, the primary high explosives were in contact with plutonium. We recommend a careful, properly validated review and analysis of possible plutonium contamination be undertaken as part of a validated sampling plan, with the analysis done by a laboratory certified for plutonium analysis by the Environmental Measurements Laboratory. Fallout background for the site should be established and detection limits should be kept well below this level. The comparison of background levels should be made to surrounding offsite areas where there is high confidence that no contamination from Pantex operations exists. The comparison of Pantex to other DOE sites in very different locations relative to the Nevada Test Site is not a meaningful comparison for background fallout levels. We note here that the Colorado surface water standard for plutonium is 0.15 picocuries per liter, based on a monthly average. The annual average would be below this amount since the maximum contaminant limit must be met each month of the year. Further the DOE has adopted a residual soil action level at the Rocky Flats Plant in Colorado that requires remediation if the Colorado surface water level of 0.15 pCi/liter is exceeded. The Colorado surface water standard should also be adopted for Pantex investigations.

#### *VI. Tritium*

The four bays in Building 12-64 are used for testing and staging of tritium reservoirs. Tritium has been released to the soil from 8 of the 9 drip spigots on the south side of the building. The highest reported value was  $1200 \pm 100$  pCi/ml. This is equal to 1.2 million picocuries per liter, which is very high compared to the drinking water standard of 20,000 picocuries per liter. The "offsite" value is reported as 2.64 pCi/ml, taken at Bushland, Texas. This is equal to 2,640 picocuries per liter, and is far higher than background tritium values for surface water. Naturally occurring tritium plus tritium in fallout (in the form of oxide – that is tritiated water) results in concentrations of a few tens of picocuries per liter in surface water. Any value of a thousand or more picocuries per liter, such as that reported for Bushland, Texas, cannot be considered *a priori* as background either for surface or groundwater. Interestingly, the RI report states that this is an "offsite" value but does not claim it as background, though this is implied. The background value for tritium needs to be established using methods that have detection limits of less than 5 picocuries per liter. The fact that tritium values "a few feet away from the drip spigots" are comparable to those at Bushland is not

equivalent to a comparison to background. These values near the drip spigots are far too high and cannot be dismissed in the manner that they are in the report.

Tritium was also been detected in soil at a level of 22 pCi/gm is well above the PRG of 3.8 pCi/gm (p. 5-38). This sample has been dismissed as an artifact of the sampling since a reanalysis showed no tritium and a second sample from the same location also showed a non-detect.. The values at all site locations go up in 1996-97 and then go down and then go back up in 2001. The 1996 time is about right for the tritium from the 1989 accident to reach the perched aquifer, according to the transport model used in the RI report. (p. 5-41 to 5-42 and G-12 to G-13) However, elevated levels are also seen in Ogallala. The RI report states that the variation in measurements “may represent a consistent difference in analysis methods or laboratory procedures.” (p. G-13) This statement appears to have a large element of speculation. No scientific basis for it has been provided and it casts further doubt upon the adequacy of the laboratory’s quality assurance procedures. The elevated levels of tritium should be thoroughly investigated, and a background level for should be established for surface water, offsite perched aquifers, and the Ogallala aquifer.

The tritium levels in 6 wells owned by 5 different individuals surrounding the facility have been measured at levels of 30 to 170 pCi/l. At least 2 of the wells are in the perched aquifer, including the wells with the highest and most consistent levels of tritium. [4 p. 5 to 6] Prior to weapons testing the level of tritium in lakes, rivers, and potable water was approximately 5 to 25 pCi/L. [3 p. 182] Given that a large fraction of U.S. potable water comes from underground sources, even 170 picocuries per liter cannot be considered as background *a priori*, let alone 2,640 reported for Bushland, Texas. The current level of tritium background, including fallout, may be taken as a few tens of picocuries per liter for surface water. The elevated levels of tritium should be thoroughly investigated. Laboratory procedures should be validated, and the laboratories used should be certified for tritium by the Environmental Measurements Laboratory. Duplicate samples should be preserved. The tritium detection limit should be below 5 pCi/L for reliable establishment of background. The minimum detectable activity reported on pages C-91 and C-92 is hundreds of picocuries per liter. We note here that the Colorado standard for tritium in surface water affected by Rocky Flats is 500 picocuries per liter, based on a monthly average. The annual average would be below this amount since the maximum contaminant limit must be met each month of the year. Further the DOE has adopted a residual soil action level at the Rocky Flats Plant in Colorado that requires remediation if the Colorado surface water level of 500 pCi/liter is exceeded.

So far as the 1989 accident is concerned, we find that the official explanation that some tritium gas was converted to an oxide (water) form and scavenged by the rain is questionable. Tritium oxidation in the atmosphere is generally slow – far slower than the time for the tritium to be blown away from the site. Recommendations: The DOE should publish an analysis based on laboratory and field data on the oxidation rates of tritium for the analysis to be credible. A full material balance and a realistic analysis of the sources of tritiated water needs to be done. Specifically, the oxidation of the adsorbed tritium in the concrete, gravel dome, etc. needs to be evaluated as to whether it is a potential source term in the future. An investigation into small leaks of tritium during operations should be conducted to examine potential sources for the tritium measured on site. The Colorado surface water standard for tritium in surface water affected by Rocky Flats should also be adopted for Pantex investigations.

## *VI. Miscellaneous Comments*

Appendix B details the possible mechanisms for the formation of depleted uranium oxide dust in the weapons. This is a source of potential material for the landfills. From the appendix it appears that two measurements of the volume of dust were used to generalize to all weapons disassembly activities. Why an assumption about the packing density of the uranium oxide dust was used instead of a direct measurement of its weight is not adequately explained. The higher activity of DU as noted in the above section would obviously increase their estimate for the total available uranium that might have ended up in the landfills by a



proportional amount. In addition, the authors note that some weapons formed thorium oxide either in addition to or in place of uranium oxide. There is no discussion of where the thorium oxide could be coming from, however. If the thorium was used in bomb parts that were in contact with the high explosive then there is the potential that they were burned at the Burning Grounds as was the uranium contaminated explosives. There were two detections of above background Th-232 at the burning grounds, which were consistent with their placement in a landfill. [1 p. 5-47 to 5-48] If thorium was burned at the Burning Grounds then the RI report should discuss the possible exposures and doses that would have been received from the thorium daughter products, and thus the source of this oxide dust should be more fully explained.

### **Acronyms**

RSSI Radiation Survey Site Investigation  
SWMU Solid Waste Management Unit  
SVS Supplemental Verification Site  
FS Firing Site  
BWD Blackwater Draw formation  
COPC Contaminant of Potential Concern  
DU Depleted Uranium  
UCL Upper Confidence Limit  
NWAR Nuclear Weapon Accident Residue  
PRG Preliminary Remediation Goal  
SSL Soil Screening Level  
UOG Upper Ogallala formation  
OSTP Old Sewage Treatment Plant  
HI Hazard Index

### **References**

- [1] BWXT Pantex, LLC., "Burning Grounds Waste Management Group Final RCRA Facility Investigation Report Volume 2 of 3, Sections 5.2 - 5.3", March 15, 2002
- [2] Robert Roback, Thomas Johnson, Travis McLing, Michael Murrell, Shangde Luo, and The-Lung Ku, "Uranium isotopic evidence for groundwater chemical evolution and flow patterns in the eastern Snake River Plain aquifer, Idaho", GSA Bulletin, 113:9 1133-1141 (September 2001)
- [3] Merrill Eisenbud and Thomas Gesell, Environmental Radioactivity From Natural, Industrial, and Military Sources Fourth Edition, Academic Press, San Diego (1997)
- [4] Texas Center for Applied Technology, "Results of the Drinking Water Sampling Program for Offsite Domestic/Residential Well Water, Conducted by the US Department of Energy Pantex Plant, September 2000 - July 2003", October 6, 2003



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July 1, 2004

Jackie Hardy, Division Director  
Texas Commission on Environmental Quality  
MC-127  
PO Box 13087  
Austin, Texas 78711-3807

**Re: Pantex Plant Final RCRA Facility Investigation Report  
Groundwater, March 2004**

Dear Ms. Hardy:

Enclosed please find STAND's comments based on its technical review of the above named document. This document was submitted to the Texas Commission on Environmental Quality in March for acceptance on an expedited schedule.

A major goal of the Pantex document was to present the case that the nature and extent of groundwater contamination at Pantex had been determined. However, the Department of Energy (DOE) neglected to address contaminants in the Ogallala Aquifer that are reasonably attributed to Pantex' past operations. Thus, STAND believes that DOE has not met the standard of describing the extent of groundwater contamination at Pantex.

We appreciate your considering community input in the ongoing cleanup efforts at Pantex. STAND believes strongly that community involvement, and a careful consideration of ideas is the strength of human health and safety when considering these important decisions.

If you have any questions about these comments, please let me know. I can be reached at (806) 358-2622.

Sincerely,

Cletus G. Stein  
President

Enclosures

CC: Robert Musick, TCEQ, MC-127 - Austin  
Ms. Camille Hueni, Superfund Division, Texas Section (6SF-AP), USEPA R-VI

**Comments on the  
Final RCRA Facility Investigation Report, Groundwater,  
U.S. Department of Energy Pantex Plant, Amarillo, Texas  
US Department of Energy, March 15, 2004**

**George Rice  
June 29, 2004**

These are comments on the U.S. Department of Energy's (DOE's) *Final RCRA Facility Investigation Report, Groundwater, U.S. Department of Energy Pantex Plant, Amarillo, Texas* (Groundwater RFI)<sup>1</sup>. They are based on a review of the Groundwater RFI and related (see references).

These comments were prepared for Serious Texans Against Nuclear Dumping (STAND). They are presented in two sections; general comments, and specific comments.

**General Comments**

**Failure to Describe Extent of Contamination**

DOE has neglected the Pantex-derived contaminants found in the Ogallala Aquifer. Thus, it has failed to adequately describe the extent of groundwater contamination at Pantex.

**Contaminants in Ogallala From Perched Aquifer**

DOE claims that no occurrences of contaminants in the Ogallala Aquifer are due to 'natural migration'<sup>2</sup>. "A complete migration pathway from the perched aquifer to the Ogallala Aquifer does not exist."<sup>3</sup>

While it is likely that some of the contaminants detected in the Ogallala migrated via 'non-natural' pathways (e.g., along improperly constructed wells such as PTX01-1003<sup>4</sup>), it is by no means clear that these are the only contaminant migration pathways to the Ogallala. In fact, the widespread distribution of contaminants in the Ogallala suggests that there are many contaminant migration pathways to the Ogallala (see table 1 and figure 1).

The most likely source of the contaminants in the Ogallala is the perched aquifer. The perched aquifer has been contaminated with many constituents derived from Pantex operations<sup>5</sup>. These contaminants were transported to the perched aquifer in water that

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<sup>1</sup> BWXT, 2004a. See references.

<sup>2</sup> BWXT, 2004a, page ES-6. The term 'natural migration' is not defined.

<sup>3</sup> BWXT, 2004a, page ES-6.

<sup>4</sup> DOE, 2003a, page 13; and BWXT, 2002a, page 5-56. Well PTX01-1003 has been plugged.

<sup>5</sup> BWXT, 2004a, figure 13.2-10.

leaked from playas, ditches, and industrial discharge locations (e.g., sumps, leaching beds, evaporation ponds)<sup>6</sup>.

**Table 1**  
**Organic Contaminants and Explosives**  
**Detected in Ogallala Aquifer at Pantex**

acenaphthene	1,2,4-trichlorobenzene	methyl isobutyl ketone (4-methyl-2-pentanone)	phenanthrene
acetone	ethylbenzene	methyl ethyl ketone (2-butanone)	pentachlorophenol
aniline	isopropylbenzene (cumene)	bromomethane	bis(2-ethylhexyl) phthalate
anthracene	hexachlorobutadiene	dibromochloromethane	di-n-butyl phthalate
benzo(a)anthracene	n-butanol	dibromodifluoromethane	diethyl phthalate
bromobenzene	1,2-dichloroethane	dichlorodifluoromethane	di-n-octyl phthalate
n-butylbenzene	1,1,1-trichloroethane	chloromethane	pyrene
sec-butylbenzene	1,1,2-trichloro-1,2,2-trifluoroethane (freon-113)	methylene chloride	benzo(a)pyrene
tert-butylbenzene	cis-1,2-dichloroethene	chloroform	carbon disulfide
chlorobenzene	trichloroethene (TCE)	carbon tetrachloride	toluene
1,2-dichlorobenzene	tert-butyl methyl ether	methyl methacrylate	2-chlorotoluene
1,3-dichlorobenzene	fluoranthene	naphthalene	4-chlorotoluene
1,4-dichlorobenzene	benzo(b)fluoranthene	2-methylnaphthalene	4-isopropyltoluene (p-cymene)
1,2,4-trimethylbenzene	benzo(k)fluoranthene	1,2-dibromo-3-chloropropane	styrene
1,3,5-trimethylbenzene	fluorine	1,1-dichloropropene	tetrahydrofuran
1,2,3-trichlorobenzene	2-hexanone	isopropanol	xylene
<b>Explosives</b>			
HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	1,3-dinitrobenzene	2,6-dinitrotoluene	4-amino-2,6-dinitrotoluene
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	perchlorate	TNT (2,4,6-trinitrotoluene)	
nitrobenzene	2-nitrotoluene	2-amino-4,6-dinitrotoluene	

<sup>6</sup> BWXT, 2004a, pages 13-2, 13-21, and 13-22.

Two things can happen to water that enters the perched aquifer. It can move laterally, in which case the extent of the perched aquifer will increase, or it can move downward, through the fine-grained zone (FGZ), toward the Ogallala Aquifer. Both things appear to have happened at Pantex. According to DOE: "*Beneath Pantex, the perched aquifer is considered to have been enlarged by wastewater discharges to the ditches and Playa 1 and is approaching equilibrium with current infiltration rates equaling loss into the FGZ.*"<sup>7</sup> It is reasonable to conclude that at least some of the contaminants detected in the Ogallala have been transported there by water that migrated from the perched aquifer.

DOE's claim that "*A complete migration pathway from the perched aquifer to the Ogallala Aquifer does not exist.*" is not supported by the available evidence.

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<sup>7</sup> BWXT, 2004a, page 3-12.



## Leakage from Perched Aquifer

DOE acknowledges the fact that some water from the perched aquifer leaks into the FGZ<sup>8</sup>. However, DOE does not appear to have quantified this leakage. This leakage should be quantified 1) as part of a water balance for Pantex, and 2) to provide an estimate of the amount of contaminated water migrating from the perched aquifer toward the Ogallala Aquifer.

## 'Upgradient' Ogallala Aquifer Wells

In the southern portion of Pantex, water in the perched aquifer flows beyond the plant boundary to the south, southeast, and southwest<sup>9</sup>. Thus, contaminants that leak from the perched aquifer may enter the Ogallala Aquifer upgradient of Pantex. Therefore, the detection of a contaminant in an upgradient portion of the Ogallala Aquifer does not necessarily mean that it did not originate from Pantex.

The following Ogallala Aquifer wells are either on the southern boundary, or south of the boundary, but beneath portions of the perched aquifer which receive water that originates on the plant<sup>10</sup>.

PTX06-1056  
PTX06-1059  
PTX06-1075  
PTX06-1076  
FPOP-MW-02  
FPOP-MW-03  
FPOP-MW-07  
FPOP-MW-08

Pantex-related contaminants have been detected in all of these wells except PTX06-1076<sup>11</sup>.

## Discarded Data<sup>12</sup>

DOE has discarded data obtained from wells fitted with FLUTe or Solinst multi-port sampling devices. This is because " ... *independent studies concluded that the multi-port devices were contributing to the detections of VOCs ...* "<sup>13</sup>. It is true that some VOCs, including benzene and toluene, were found to be leached from materials used to

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<sup>8</sup> BWXT, 2004a, page 3-12.

<sup>9</sup> BWXT, 2004a, figure 3-27.

<sup>10</sup> BWXT, 2004a, figure 3-27.

<sup>11</sup> DOE, 1998 – 2003.

<sup>12</sup> None of the data presented in these comments are associated with blanks or are believed to be due to leaching of materials used to collect samples.

<sup>13</sup> BWXT, 2004a, table 4-1.

construct the sampling devices<sup>14</sup>. However, the studies did not conclude that all detected VOCs were leached from the multi-port devices<sup>15</sup>.

A number of VOCs were detected in samples from wells fitted with FLUTe or Solinst sampling devices, but were not found to be leached from materials used to construct the sampling devices (see table 2)<sup>16</sup>. DOE should not discard these results.

**Table 2**  
**VOCs detected in Wells Fitted with FLUTe or Solinst Devices**  
**Not Shown to be Leached from Sampling Materials**

1,2-DCA <sup>17</sup> cis-1,2-DCE <sup>18</sup> acetone chlorobenzene	chloromethane dibromochloromethane 2-hexanone MEK <sup>19</sup>	methyl isobutyl ketone TCE <sup>20</sup> xylenes
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DOE also discarded data from samples that were collected from well PTX01-1012 before the FLUTe device was installed<sup>21</sup> (see table 3). DOE claims that the data are *"non-representative of actual groundwater conditions due to incomplete well development."*<sup>22</sup> However, DOE has not explained how this would affect the VOC analyses<sup>23</sup>. DOE should not discard the pre-FLUTe data for PTX01-1012 unless it can show that the data are invalid.

<sup>14</sup> Both benzene and toluene were found to be leached from FLUTe materials. However, only benzene was found to be leached from Solinst materials (Gilmore et al., 2002).

<sup>15</sup> For example, acetone was not leached from any sampling equipment material. It should be noted that acetone was detected in a gas purge (nitrogen) of sample tubing, but not in any water leach tests (Gilmore et al., 2002, page 1).

<sup>16</sup> For listings of VOCs leached from sampling equipment materials see the laboratory analyses associated with Gilmore et al., 2002. For listings of VOCs detected in wells fitted with FLUTe or Solinst sampling devices, see Rice and Allison, 2004, appendix D.

<sup>17</sup> DCA = dichloroethane

<sup>18</sup> DCE = dichloroethene

<sup>19</sup> MEK = methyl ethyl ketone

<sup>20</sup> TCE = trichloroethene

<sup>21</sup> DOE 1998 – 2003, analytical results for the second and third quarters of 2000.

<sup>22</sup> BWXT, 2003a, page 3-8.

<sup>23</sup> DOE states that turbidity likely affected the reported values, but does not explain how this would occur (BWXT, 2003a, page 3-8).



**Table 3**  
**Contaminants Detected in Well PTX01-1012 before FLUTe Device Installed**

Contaminant	Maximum Concentration Detected (µg/L) (6/1/00 – 9/5/00)
1,2,4-trimethylbenzene	0.35
acetone	99
ethylbenzene	0.14 (J) <sup>24</sup>
methylene chloride	7.9
MEK	2.4 (J)
methyl isobutyl ketone	3.2 (J)
toluene	150 (D) <sup>25</sup>

Finally, DOE discarded data from two wells (PTX01-1010<sup>26</sup> and PTX01-1013<sup>27</sup>) that did not have FLUTe or Solinst sampling devices installed<sup>28</sup> (see table 4). DOE should explain why it discarded these data.

**Table 4**  
**Discarded Detections for Wells PTX01-1010 or PTX01-1013**

Contaminant	Maximum Concentration Detected (µg/L)
1,4-dichlorobenzene	0.17 (J)
1,2,4-trimethylbenzene	0.82 (J)
1,3,5-trimethylbenzene	0.3 (J)
acetone	180
ethylbenzene	0.077 (J)
methylene chloride	7.9
MEK	15
methyl isobutyl ketone	4.2
toluene	71.4
xylene	0.31 (J)

### Detection Limits Increased

In March 2002 DOE changed the method detection limits (MDLs) for acetone, toluene, and methylene chloride<sup>29</sup>. This appears to have affected the number of detections reported for Ogallala Aquifer wells. In the 22 months prior to March 2002, there were 27, 19, and 6 detections of acetone, toluene, and methylene chloride, respectively. Between

<sup>24</sup> Values qualified with 'J' are estimated values. These are analytical results that are greater than the detection limit but less than the reporting limit.

<sup>25</sup> Qualifier 'D' means the sample was diluted for analysis.

<sup>26</sup> Data for 4/26/00 discarded.

<sup>27</sup> Data for 6/1/00 through 9/13/00 discarded.

<sup>28</sup> BWXT, 2004a, table 4-1.

<sup>29</sup> BWXT, 2004a, page 11-15.

March 2002 and December 2003, there were 1, 4, and 1 detections of acetone, toluene, and methylene chloride, respectively<sup>30</sup>.

DOE claims the MDLs were increased because of "... *higher than expected false-positive rates ...*", and to be "... *consistent with the intent of 40 CFR 136, Appendix B.*" However, DOE has not presented any documentation to show that false-positives were occurring at an unacceptable rate, or that the increased MDLs resulted in a program that is more consistent with the CFR.

### **Source of Contaminants in Ogallala Aquifer at Burning Grounds**

Contaminants were disposed at the Burning Grounds for many years<sup>31</sup>, and many contaminants have been detected in the Ogallala Aquifer at, and down gradient of, the Burning Grounds (see figure 1).

DOE claims that all contaminants entered the Ogallala through a single source, well PTX01-1003<sup>32</sup>. While this well is probably the source of some of the contaminants, the data do not support the claim that it is the source of all the contaminants. Many contaminants detected in other wells at and down gradient of the Burning Grounds have not been detected in well PTX01-1003. In addition, some of the contaminants detected in well PTX01-1003 have not been detected in the other wells (see table 5).

If well PTX01-1003 were the source of all the contaminants, we would expect to detect essentially the same contaminants in all the wells<sup>33</sup>. Instead, there are significant differences. This indicates that PTX06-1003 is not the only source of the contaminants.

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<sup>30</sup> DOE 1998 – 2003, analytical results for 5/00 through 12/03

<sup>31</sup> Between 1954 and 1980, 150,000 to 300,000 gallons of contaminated waste oils and solvents were disposed in pits at the Burning Grounds. The pits are known to have overflowed and run into Playa 3 (BWXT, 2002a, page 5-21).

<sup>32</sup> BWXT, 2004a, page 13-5.

<sup>33</sup> There could be differences due to dispersion (contaminants diluted to concentrations below the detection level) and biotransformation (such as TCE being transformed to DCE).

**Table 5**  
**Comparison of Contaminants Detected in Well PTX06-1003 with**  
**Contaminants Detected in Other Wells in the Vicinity of the Burning Grounds**

<b>Well</b>	<b>Contaminants Detected<sup>34</sup></b>	<b>Location<sup>35</sup></b>
PTX01-1003	<i>1,1,1-trichloroethane<sup>36</sup>, benzo(a)anthracene, carbon tetrachloride, Freon-113, methylene chloride, TCE, toluene</i>	Burning Grounds
PTX06-1057A	<b>methyl methacrylate<sup>37</sup>, toluene</b>	approximately 1700 feet up gradient of the Burning Grounds
PTX01-1005	<b>2-amino-4,6,-dinitrotoluene, 4-amino-2,6,-dinitrotoluene, 1,3-dinitrobenzene, 2,6-dinitrobenzene, acetone, aniline, bis(2-ethylhexyl)phthalate, MEK, nitrobenzene, TNT</b>	Burning Grounds
PTX01-1010	<b>2-nitrotoluene, acetone, bis(2-ethylhexyl)phthalate, RDX, toluene</b>	Burning Grounds
PTX01-1011	<b>acetone, di-n-octylphthalate, toluene</b>	Burning Grounds
OW-WR-47	toluene	Burning Grounds
OW-WR-46	<b>2-nitrotoluene, carbon tetrachloride</b>	approximately 1300 feet down gradient of the Burning Grounds
PTX06-1062A	<b>bis(2-ethylhexyl)phthalate, chloroform, toluene</b>	approximately 1800 feet down gradient of the Burning Grounds
PTX01-1012	<b>1,2-DCA, 1,2,4-trimethylbenzene, acetone, chloromethane, dibromochloromethane, ethylbenzene, methylene chloride, MEK, methyl isobutyl ketone, tert-butyl methyl ether, tetrahydrofuran, xylene, toluene</b>	approximately 2400 feet down gradient of the Burning Grounds
PTX06-1066	<b>cis-1,2-DCE, acetone, n-butanol, isopropanol, MEK, methyl methacrylate, toluene</b>	approximately 2600 feet down gradient of the Burning Grounds
PTX06-1064	<b>2-hexanone, acetone, n-butanol, MEK, TCE, tert-butyl methyl ether</b>	approximately 4800 feet down gradient of the Burning Grounds

<sup>34</sup> DOE, 1998 – 2003.

<sup>35</sup> BWXT, 2004a, figure 3-17.

<sup>36</sup> Italics indicate contaminants detected in PTX01-1003 but not in the other wells.

<sup>37</sup> Bold indicates contaminants not detected in well PTX01-1003.

## **Lack of Monitor Wells**

Groundwater conditions beneath large areas of Pantex are unknown because they contain no monitor wells. These areas include:

Approximately 1 mi<sup>2</sup> between the Burning Grounds and the Pantex supply wells<sup>38</sup>.

Approximately 2 mi<sup>2</sup> in the western portion of Pantex.<sup>39</sup>

Approximately 1 mi<sup>2</sup> south of the Burning Grounds. This area contains only one perched aquifer well (PTX06-1055, dry) and one Ogallala Aquifer well (PTX06-1057A)<sup>40</sup>.

DOE should install enough monitor wells in these areas to determine groundwater conditions in the perched aquifer and the Ogallala Aquifer.

## **Use of Regional Background Values**

DOE used regional background values to evaluate metal concentrations at Pantex<sup>41</sup>. The use of regional values is not appropriate, as some of the background samples are from wells more than 50 miles from Pantex<sup>42</sup>.

DOE used the regional values selectively. In some cases where regional concentrations exceed the background levels established for Pantex, DOE states that the concentration is within the regional range, and therefore should not be ascribed to activities at Pantex<sup>43</sup>. However, the regional background value for thallium was less than the value established for Pantex<sup>44</sup>. DOE does not mention this fact and continues to use a questionable thallium value for background at Pantex (see below).

DOE should not use regional background values unless it can show that the regional values are representative of conditions at Pantex.

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<sup>38</sup> BWXT, 2004a, figure 3-17.

<sup>39</sup> BWXT, 2004a, figure 3-17.

<sup>40</sup> BWXT, 2004a, figure 3-17.

<sup>41</sup> BWXT, 2004a, page 14-1. See discussions of manganese (perched aquifer, BWXT, 2004a, pages 10-19 and 10-20), boron (BWXT, 2004a, page 11-7), chromium (BWXT, 2004a, page 11-9), manganese (Ogallala Aquifer, BWXT, 2004a, page 11-9), molybdenum (BWXT, 2004a, page 11-10), and zinc (BWXT, 2004a, page 11-12).

<sup>42</sup> Schriver and Hopkins, 1998, figure 1.

<sup>43</sup> BWXT, 2004a. See discussions of manganese (perched aquifer, pages 10-19 and 10-20), boron (page 11-7), chromium (page 11-9), manganese (Ogallala Aquifer, page 11-9), molybdenum (page 11-10), and zinc (page 11-12).

<sup>44</sup> . No thallium was detected in any of the regional samples (thallium detection limit = 0.01 µg/L, Schriver and Hopkins, 1998, table 3 and page 11).

## **“Background Variability”**

In some cases where metal concentrations exceed the background values established for Pantex<sup>45</sup>, DOE attributes the exceedance to “background variability”<sup>46</sup>. The meaning of this term is unclear, but DOE states that some metal concentrations which exceed the established background concentrations “... *do not result from Pantex activities.*”<sup>47</sup>

DOE appears to be claiming that concentrations which exceed the established background concentrations are also background concentrations. If this claim is accepted, what is the meaning of the established background concentrations?

When evaluating metal concentrations at Pantex, DOE should use the background values established for Pantex. If DOE believes that any of these values should be revised, it should conduct the studies necessary to support the revisions.

## **Thallium and Chromium Background Values**

The DOE's background values<sup>48</sup> for thallium and chromium are too high<sup>49</sup>. For each metal, the highest concentration detected was found in well PTX08-1011A<sup>50</sup>. However, this well should not be considered a background well. First, it is on Pantex property, more than a quarter mile from any boundary<sup>51</sup>. Second, RDX was detected in this well<sup>52</sup>. This indicates that the well has been affected by Pantex activities. Also, available records do not indicate whether the metals samples were filtered prior to preservation<sup>53</sup>. Unfiltered samples can result in unrealistically high estimates of metal concentrations<sup>54</sup>.

## **Perchlorate in (b) (6) Domestic Well**

Perchlorate has been detected in the (b) (6) domestic well<sup>55</sup>. This well is just west of the northwest boundary of Pantex<sup>56</sup>. The perchlorate may be from an off-plant source,

<sup>45</sup> DOE, 2002a, table C-2.

<sup>46</sup> See, for example, discussions of antimony and selenium concentrations (BWXT, 2004a, page 10-21).

<sup>47</sup> BWXT, 2004a, page 10-21.

<sup>48</sup> RRS 1 action levels

<sup>49</sup> BWXT, 2004a, table 10.2-3; and DOE, 2002a, table 3.6.

<sup>50</sup> DOE, 2002a, table C-2.

<sup>51</sup> Well PTX08-1011A is approximately 1400 feet from the western boundary and 1600 feet from the southern boundary (BWXT, 2004a, figure 3-17).

<sup>52</sup> RDX = 0.3 (J) µg/L, 6/2/99 (DOE 1998 – 2003).

<sup>53</sup> The *Risk Reduction Rule Guidance* (DOE, 2002a) contains no indication that any of the background samples were filtered.

<sup>54</sup> Unfiltered water samples may contain fine sediments that dissolve and release metals when acid is added to preserve the samples. Thus, estimates of background metal concentrations that are based on unfiltered samples may be too high. DOE agrees that unfiltered samples may result in the overestimation of metal concentrations. In a report concerning off-site wells, DOE states the following: “*The undissolved metals and radiochemistry parameters are dissolved as the sample preservative is added. This gives the sample a higher reading than what would be obtained from a water sample. These samples should be filtered to remove these undissolved constituents*” (DOE 2002b, section 23).

<sup>55</sup> TEES, 2003, page 6. Perchlorate concentrations: 4.2 µg/L (November 2001), and 4.3 µg/L (April 2003).

<sup>56</sup> TEES, 2003, figure 1.



or it may have been drawn from Pantex by the cone of depression created by pumping the (b) (6) well. DOE should attempt to determine the source of the perchlorate.

### Specific Comments

#### Page 3-16, Table 3.3-4

The values of hydraulic conductivity presented in this table are based on laboratory measurements of core samples. DOE uses these values to argue that the FGZ is a "vertical migration barrier". However, laboratory measurements often underestimate the bulk permeability of a unit because they do not account for features (e.g., offset beds, fractures, stream channels) that may significantly increase the hydraulic conductivity of a unit<sup>57</sup>. DOE should acknowledge this fact in the text.

#### Page 3-22, paragraph 3

DOE states that the existing hydraulic gradient (north to northeast) in the Ogallala Aquifer "... results from pumping both from the Pantex water supply wells in the northeastern part of the Plant and from Amarillo's well field to the north." This statement requires an explanation. If DOE believes the direction of the hydraulic gradient at Pantex was different in the past, it should provide the information that supports this belief.

#### Page 4-1, paragraph 2

In evaluating water quality at Pantex, DOE considered only data from samples collected between July 1, 2000 and September 30, 2003. The reason for not using data from samples collected before July 1, 2000 is unclear, as valid data exists for samples collected prior to this date<sup>58</sup>. DOE should explain why it chose not to use all of the available data.

Also, in choosing not to use data collected before July 1, 2000, DOE is neglecting some wells. Two Ogallala wells, PTX06-1016<sup>59</sup> and OW-WR-40<sup>60</sup>, were not sampled after July 1, 2000, although organic contaminants have been detected in both wells<sup>61</sup>.

#### Page 4-1, paragraph 4

Regarding wells with FLUTe and Solinst sampling devices, DOE states "Sample results for the wells prior to low-flow/multi-port sampling did not indicate the presence of VOCs

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<sup>57</sup> Linsley, Kohler, and Paulhus, 1958, page 131; Davis and DeWiest, 1966, page 165.

<sup>58</sup> DOE, 1998 – 2003.

<sup>59</sup> Well PTX06-1016 was last sampled on 5/19/1999.

<sup>60</sup> Well OW-WR-40 was last sampled on 10/07/98.

<sup>61</sup> See Rice and Allison, 2004.

*in groundwater.*" This is not correct. A number of VOCs were detected in well PTX01-1012 prior to installation of the Solinst sampling device<sup>62</sup> (see comment above).

#### **Page 4-2, paragraph 2**

DOE did not use data for samples collected from the Pantex supply wells. The reasons given are: sampling techniques, high pumping rates, and inconsistent well construction. However, variations in sampling techniques (as long as they are valid), high pumping rates, and differences in construction (e.g., screen lengths) should not necessarily preclude the use of data from these wells<sup>63</sup>.

The high pumping rates may drive-off some VOCs, and long well screens may dilute contaminants. Nonetheless, samples from these wells may still provide useful information and should be used, with the understanding that the analytical results may be underestimates of aquifer concentrations.

#### **Page 4-6, paragraph 3**

DOE discarded anomalous analytical results. *"Results that suggest obvious aberrations in the historical pattern are suspect and rejected. ... If the confirmatory re-sampling shows a good fit to the historical pattern for that well, the initial, anomalous sample result is removed from the data set and replaced by the confirmatory sample."*

Analytical results should not be removed from the data set unless it can be shown that sampling errors, laboratory errors, or other errors rendered them invalid.

#### **Page 4-11, paragraph 1**

DOE did not use data for samples collected from wells BEG-PTX-2, BEG-PTX-3, and wells FPOP MW02 through FPOP MW08. The reason given is that the " ... wells were not constructed in accordance with Pantex well specifications."

Data from these wells should not be used if: 1) they were constructed in a way that would result in unrepresentative samples, or 2) important construction information is not known (e.g., screened units). However, if the construction is merely different, but would not result in unrepresentative samples, data from the wells should be used.

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<sup>62</sup> DOE, 1998 – 2003.

<sup>63</sup> Of course, the data should not be used if conditions exist that would result in invalid data, e.g., well screened across both the perched aquifer and the Ogallala Aquifer, materials used that are known to leach contaminants.

**Page 6-12, Table 6.4-1**

DOE's risk reduction standard (RRS) 1 action level (AL) for bis(2-ethylhexyl) phthalate is 20 µg/L. However, the maximum contaminant level (MCL) for bis(2-ethylhexyl) phthalate is 6 µg/L<sup>64</sup>. DOE should explain why the RRS 1 AL is greater than the MCL.

**Page 6-13, Table 6.4-2**

Several of the maximum concentrations listed in table 6.4-2 (Summary of Compounds Detected in the Ogallala Aquifer) are incorrect. Values that exceeded the reported maximum are given in table 6.

**Table 6**  
**Errors in Maximum**  
**Concentrations, Table 6.4-2**

<b>Compound</b>	<b>Maximum Concentration Reported in Table 6.4-2 (µg/L)</b>	<b>Values Greater than Reported Maximum (µg/L) (well, date)</b>
1,4-dichloro benzene	0.17	3.1 (PTX06-1033, 10/14/98), 0.21 (PTX07-1R01, 9/19/00)
acenaphthylene	0.25	0.32 (PTX07-1R01, 5/29/01)
acetone	29	180 (PTX01-1013, 6/1/00), 120 (PTX01-1011, 6/1/00), 99 (PTX01-1012, 6/1/00), 84 (PTX01-1012, 9/5/00), 53 (PTX06-1061, 5/29/01), 98 (PTX06-1065, 7/23/01), 31 (PTX06-1065, 7/23/01), 41 (PTX06-1065, 7/23/01), 34 (PTX06-1065, 8/15/01), 31 (PTX06-1065, 8/15/01), 30 (PTX06-1066, 7/23/01), 32 (PTX06-1066, 7/23/01), 38 (PTX06-1066, 7/23/01), 40 (PTX06-1066, 9/24/01)
bis(2-ethylhexyl) phthalate	5.6	118 (FPOP-MW-03, 7/26/01) 31 (FPOP-MW-02, 6/26/01), 11 (FPOP-MW-07, 6/28/01),
carbon disulfide	0.47	1.3 (PTX06-1043, 1/25/00)

<sup>64</sup> EPA 1998a. In this document, bis(2-ethylhexyl) phthalate (C.A.S. 117-81-7) is listed under a synonym, di(2-ethylhexyl) phthalate (see NIOSH Pocket Guide to Chemical Hazards, <http://www.cdc.gov/niosh/npgd/npgd0236.html>).



**Table 6 (continued)**  
**Errors in Maximum Concentrations, Table 6.4-2**

Compound	Maximum Concentration Reported in Table 6.4-2 (µg/L)	Values Greater than Reported Maximum (µg/L) (well, date)
chloroform	0.2	0.43 (b) (6) Domestic, 11/30/00), 0.3 (b) (6) Domestic, 4/17/00), 0.36 (b) (6) Domestic, 10/30/00), 0.37 (b) (6) Domestic, 12/14/00), 0.37 (b) (6) Domestic, 1/9/01), 0.36 (b) (6) Domestic, 5/3/01), 0.31 (b) (6) Domestic, 6/4/01), 0.22 (b) (6) Domestic, 7/9/01), 0.21 (b) (6) Domestic, 8/6/01), 0.25 (b) (6) Domestic, 11/5/01), 0.36 (b) (6) Domestic, 12/3/01), 0.22 (b) (6) Domestic, 1/14/02), 0.35 (b) (6) Domestic, 4/1/02)
di-n-butyl phthalate	2.9	6.8 (Pantex supply well 15- 26, 2/19/01)
methyl methacrylate	0.2	0.5 (PTX06-1066, 7/23/01)
methylene chloride	5.6	7.9 (PTX01-1012, and PTX01-1013, 6/1/00)
RDX	0.22	0.35 (PTX06-1033, 5/11/99; and Pantex supply well 15- 20, 5/8/03), 0.3 (PTX08- 1011A, 6/2/99)
TCE	2.3	8 (PTX01-1003, 5/13/99), 3.8 (PTX01-1003, 8/19/99), 4.4 (PTX01-1003, 10/4/99), 5.3 (PTX01-1003, 2/8/00), 4 (PTX01-1003, 3/2/00), 3 (PTX01-1003, 3/13/00), 6.7 (PTX01-1003, 4/18/00),
toluene	14	150 (PTX01-1012, 9/5/00), 46 (PTX01-1012, 6/1/00), 33 (PTX01-1003, 4/18/00), 71 (PTX01-1013, 9/13/00),

**Page 6-13, Table 6.4-2**

Many compounds that were detected in the Ogallala Aquifer are not listed in table 6.4-2 (Summary of Compounds Detected in the Ogallala Aquifer). A list of the missing compounds is given in table 7.

**Table 7**  
**Missing Compounds, Table 6.4-2**

<b>Compound</b>	<b>Maximum Concentration Detected (µg/L) (well, date)</b>
2-amino-4,6-dinitrotoluene	0.22 (J) (PTX01-1005, 11/7/01)
4-amino-2,6-dinitrotoluene	0.88 (PJ) (PTX01-1005, 3/4/02)
aniline	3.6 (J) (PTX01-1005, 3/4/02)
bromobenzene	1.8 (J) (PTX06-1033, 10/14/98)
bromomethane	1.2 (J) ((b) (6) Domestic, 6/27/00)
n-butanol	85 (J) (PTX06-1067, 7/12/01)
n-butylbenzene	1.8 (J) (PTX06-1033, 10/14/98)
sec-butylbenzene	1.2 (J) (PTX06-1033, 10/14/98)
tert-butylbenzene	0.94 (J) (PTX06-1033, 10/14/98)
carbon tetrachloride	0.33 (J) (OW-WR-46, 7/25/00)
chlorobenzene	1.7 (J) (PTX06-1033, 10/14/98)
chloromethane	0.29 (J) ((b) (6) Domestic, 9/4/01)
2-chlorotoluene	2 (J) (PTX06-1033, 10/14/98)
4-chlorotoluene	2.5 (J) (PTX06-1033, 10/14/98)
1,2-dibromo-3-chloropropane	3.2 (OW-WR-40, 10/7/98)
dibromochloromethane	0.14 (J) (PTX01-1012, 10/10/01)
dibromofluoromethane	44 (PTX06-1016, 5/19/99)
1,2-dichlorobenzene	2.4 (J) (PTX06-1033, 10/14/98)
1,3-dichlorobenzene	2.9 (J) (PTX06-1033, 10/14/98)
1,2-dichloroethane	1.9 (J) (PTX06-1033, 10/14/98)
1,1-dichloropropene	1 (J) (PTX06-1033, 10/14/98)
1,3-dinitrobenzene	0.036 (PJ) (PTX01-1005, 3/4/02)
2,6-dinitrotoluene	0.04 (PJ) (PTX01-1005, 3/4/02)
ethylbenzene	1.5 (J) (PTX06-1033, 10/14/98)
hexachlorobutadiene	0.66 (J) (OW-WR-40, 10/7/98)
2-hexanone	0.5 (J) (PTX06-1064, 7/12/01)
isopropanol	63 (J) (PTX06-1065, 7/23/01)
isopropylbenzene	1.3 (J) (PTX06-1033, 10/14/98)
4-isopropyltoluene	1.6 (J) (PTX06-1033, 10/14/98)
MEK	15 (PTX01-1013, 9/13/00)
methyl isobutyl ketone	4.6 (J), (OW-WR-40, 10/7/98)

**Table 7 (continued)**  
**Missing Compounds, Table 6.4-2**

Compound	Maximum Concentration Detected (µg/L) (well, date)
methyl methacrylate	0.5 (J) (PTX06-1066, 7/23/01)
naphthalene	3.9 (OW-WR-40, 10/7/98)
nitrobenzene	0.89 (PJ), (PTX01-1005, 3/4/02)
perchlorate	6.75 (PTX06-1043, 9/13/00)
styrene	1.6 (J) (PTX06-1033, 10/14/98)
tert-butyl methyl ether	0.5 (J) (PTX06-1063A, 7/12/01)
tetrahydrofuran	0.7 (J) (PTX01-1012, 7/11/01)
TNT	0.2 (J) (PTX01-1005, 5/15/01)
1,2,3-trichlorobenzene	3 (J) (PTX06-1033, 10/14/98)
1,2,4-trichlorobenzene	1.8 (J) (PTX06-1033, 10/14/98)
1,2,4-trimethylbenzene	2.2 (J) (PTX06-1033, 10/14/98)
1,3,5-trimethylbenzene	1.8 (J) (PTX06-1033, 10/14/98)
xylenes	4.9 (PTX06-1033, 10/14/98)

**Page 8-4, Table 8.1-2 and paragraph 1**

DOE claims that well PTX01-1003 was the source of all of the deep soil gas contamination at the Burning Grounds.

But, some of the highest deep zone concentrations occur at well PTX01-1012. PTX01-1012 is approximately 3500 feet from PTX01-1003<sup>65</sup>.

At Zone 11, on the other hand, DOE claims that the deep zone soil gas contaminants detected in well PTX06-1072 are false positives because, among other reasons, the potential source " ... is too far (4000 feet) removed from Zone 11 to provide a conduit."<sup>66</sup>

This appears to be inconsistent. DOE should explain why soil gas contaminants at the Burning Grounds could travel 3500 feet, but at Zone 11 could not travel 4000 feet<sup>67</sup>.

**Page 11-2, paragraph 1**

DOE states: "Data collected since July 1996 were reviewed for this evaluation. Particular attention was given to data reported since July 2000 in order for the evaluation and descriptions to be representative of current conditions." The meaning of this statement is unclear. DOE should explain how data collected between July 1996 and July 2000 were used in the Groundwater RFI.

<sup>65</sup> BWXT, 2004a, figure 3-17.

<sup>66</sup> BWXT, 2004a, page 13-5.

<sup>67</sup> Many of the contaminants at wells PTX01-1012 and PTX06-1072 are the same, e.g., benzene, ethylbenzene, and xylene (BWXT, 2004a, table 8.1-2).

**Page 11-4, paragraph 1**

The value given for HMX (0.01 µg/L) is incorrect. The correct value is 0.1 µg/L<sup>68</sup>.

**Page 11-13, paragraph 8, and page 11-14, paragraph 1**

DOE states that bis(2-ethylhexyl) phthalate was not detected in the Ogallala Aquifer in concentrations that exceeded the RRS 1 AL (20 µg/L). This is incorrect; 30.8 µg/L was detected in well FPOP-MW-02 (6/26/01), and 118 µg/L was detected in well FPOP-MW-03 (7/26/01)<sup>69</sup>. In addition, 11.4 µg/L was detected in well FPOP-MW-07. This value exceeds the MCL (6 µg/L).

**Page 11-16, paragraph 1**

DOE states that acetone was not detected in the Ogallala Aquifer in concentrations that exceeded the RRS 1 AL (50 µg/L). This is incorrect. Table 8 lists the wells in which acetone concentrations exceeded 50 µg/L<sup>70</sup>.

**Table 8**  
**Ogallala Aquifer Wells with Acetone**  
**Concentrations Greater than the RRS 1 AL (50 µg/L)**

Well	Acetone Concentration (µg/L)	Date
PTX01-1011	120	6/1/00
PTX01-1012	99	6/1/00
	84	9/5/00
PTX01-1013	180	6/1/00
PTX06-1061	53	5/29/01
PTX06-1065	98	7/23/01

**Pages 11-16 and 11-17, section 11.2.9.2**

Concentrations of toluene (BZME) greater than the RRS 1 AL (5 µg/L) have been found in a number of Ogallala Aquifer wells.

For all of these wells, DOE states: *"Factors indicating that BZME detected in samples from the Ogallala Aquifer is not related to Pantex activities include (1) exceedances of BZME definitely attributed to multi-level sampling systems; (2) poor well construction at PTX01-1003; (3) exceedances at several wells occurred only in the initial sample following well installation; (4) sampling materials have been documented to leach VOCs*

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<sup>68</sup> DOE, 1998 – 2003.

<sup>69</sup> DOE, 1998 – 2003.

<sup>70</sup> DOE, 1998 – 2003.



into samples before analysis, and (5) low levels of contamination found in laboratory blanks.”

The only factor that DOE applies to the detections in wells PTX06-1057A and PTX06-1068 is factor (3). It is not clear why this factor leads to the conclusion that the detections are “... not related to Pantex activities ...”. DOE should either explain this conclusion or retract it.

DOE does not apply any of the factors listed above to the detections reported for well PTX01-1010. Nonetheless, DOE concludes that the toluene detected in this well is also “... not related to Pantex activities ...”. DOE should explain how it came to this conclusion.

#### **Page 12-1, paragraph 2**

DOE claims that the offsite contaminants in the Ogallala Aquifer are not due to ‘natural migration’. They claim that all these contaminants are caused by a single faulty well, PTX01-1003<sup>71</sup>. This is not correct (see comments above).

Contaminants associated with Pantex have been detected in the following offsite Ogallala Aquifer wells (see figure 1):

PTX06-1056	PTX06-1066	FPOP-MW-04 <sup>72</sup>
PTX06-1063A	PTX06-1067	FPOP-MW-05
PTX06-1064	FPOP-MW-02	FPOP-MW-07
PTX06-1065	FPOP-MW-03	FPOP-MW-08

#### **Page 12-2, paragraph 5**

DOE states “Thus, all potential onsite sources of contamination are located downgradient relative to the north property.” This implies that contaminants from Pantex cannot be transported across the northern boundary.

This is not correct. First, flow in the Ogallala Aquifer is toward the northeast<sup>73</sup>. Second, flow in portions of the perched aquifer is to the north<sup>74</sup>. Finally, the perched system in the northeast portion of the plant extends beyond the plant’s northern boundary. The hydraulic gradient for this system isn’t well defined, although water levels indicate that some water may flow northward<sup>75</sup>. Explosives and VOCs have been detected in this system<sup>76</sup>.

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<sup>71</sup> BWXT, 2004a, page 13-5.

<sup>72</sup> The contaminants in wells FPOP-MW-04 and FPOP-MW-05 probably originated in Playa 5. Until about 1992, sanitary and industrial waste from Amarillo Air Base were discharged to Playa 5 (Battelle, 1997, page 8).

<sup>73</sup> BWXT, 2004a, figure 3-28.

<sup>74</sup> BWXT, 2004a, figure 3-27.

<sup>75</sup> BWXT, 2004a, figure 3-27.

<sup>76</sup> See, for example, figures 10.2.2-2 and 10.2.9-8 (BWXT, 2004a).

### Page 13-5, paragraph 3

DOE states “COPCs have not been detected in surrounding wells, including those downgradient of the Burning Grounds. This is not correct. See table 5 above (Comparison of Contaminants Detected in Well PTX06-1003 with Contaminants Detected in Other Wells in the Vicinity of the Burning Grounds).

### Page 13-5, paragraph 5, and page 13-6, paragraph 1

The following contaminants were detected in the deep soil zone gas at well PTX06-1072<sup>77</sup>:

acetone	ethylbenzene	toluene
benzene	MEK	m,p xylene
carbon disulfide	methylene chloride	o-xylene
1,4-dichlorobenzene	1,2,4-trimethylbenzene	

DOE claims these detections are false positives. Two arguments are advanced to support this claim.

First, DOE gives five reasons why the contaminants should not exist at this location (bullets on bottom of page 13-5). This amounts to declaring that DOE does not understand why the contaminants are present, therefore they are not present<sup>78</sup>.

Second, acetone and xylene readily partition into water. But, neither acetone nor xylene was detected in groundwater at PTX06-1072. This, says DOE, calls the validity of the soil gas detections into question. However, high concentrations of acetone in soil gas do not necessarily result in detections in groundwater. For example, the deep soil zone acetone concentration at PTX06-1057A is higher than that at PTX06-1072 (350 ppbv vs. 85 ppbv)<sup>79</sup>. But, no acetone has been detected in groundwater from PTX06-1057A.

DOE does not appear to have a valid reason for rejecting the soil gas analyses. Unless DOE can show that sampling errors, laboratory errors, or other errors rendered them invalid, the analytical results should be considered valid.

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<sup>77</sup> BWXT, 2004a, table 8.1-2.

<sup>78</sup> DOE has relied on similar arguments in the past. In response to a TNRCC comment concerning the lack of groundwater information in the area southeast of Playa 1, between monitor well PTX08-1002 and the plant boundary, DOE stated: “It is unlikely that groundwater contamination exists in the perched aquifer in this area due to a lack of potential historic or present sources or releases (i.e., Plant production facilities and buildings, drainage ditches, etc.)”. The groundwater in this area was subsequently found to be highly contaminated (RDX >2000 µg/L). Stoller, 2001, page 1-145 and figure 4-1.

<sup>79</sup> BWXT, 2004a, table 8.1-2.

## Figure 13.2-10

This schematic conceptual site model does not show pathways to the Ogallala Aquifer via the perched aquifer or soil gas. These pathways have been discussed in comments above. Another likely pathway to the Ogallala Aquifer has also been neglected: Playa 4. Water from Zones 11 and 12 was discharged to Playa 4<sup>80</sup>. Pantex-associated contaminants have been detected immediately down gradient of Playa 4, in Ogallala well FPOP-MW-07<sup>81</sup>.

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<sup>80</sup> BWXT, 2004a, figure 13.2-10

<sup>81</sup> BWXT, 2004a, figure 3-28; and DOE, 1998 – 2003.

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